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ANTI-TUBERCULOSIS VACCINATION

If the work of Calmette and his associates at the Pasteur Institute in Paris has inspired any hopes in the hearts of veterinarians on this side of the Atlantic, these are very rapidly being dissipated as the results of the experiments of different scientific workers are being reported.

At the Minneapolis meeting of the A. V. M. A., last year, Dr. E. A. Watson, of the Canada Department of Agriculture, presented a very comprehensive report on the work done by him and his associates[1] in an effort to confirm the findings of Calmette. Dr. Watson concluded that Bacillus Calmette-Guérin has not been entirely deprived of its virulence, nor can it be said that this particular strain of the tubercle bacillus is harmless for all species of animals. Dr. Watson further pointed out the dangers of B. C. G. regaining its virulence under favorable conditions. In the experiments reported by Dr. Watson, it was shown that B. C. G. will produce tuberculosis in guinea pigs, after a long period, and that the disease thus produced may be transmitted from animal to animal in serial passage.

The results of some experiments conducted under the auspices of the Illinois State Department of Agriculture, by Drs. Larson and Evans, were reported at the 1928 meeting of the United States

[1]Watson, E. A.: Researches on Bacillus-Calmette-Guérin and Experimental Vaccination Against Bovine Tuberculosis. Jour. A.V.M.A., lxxiii (1928), n.s. 26 (7), pp. 799-816.

Live Stock Sanitary Association.[2] These experiments were equally disappointing. The outcome of the experiments would strongly indicate that the Calmette method of vaccination has no value as a means of prophylaxis against bovine tuberculosis. It is true that the number of calves used in the Illinois experiments was small, but the results were in line with those obtained by other workers who have reported.

In this issue of the JOURNAL appears a report of some work that was initiated by the late Dr. E. C. Schroeder and carried to a conclusion by his associates at the U. S. Bureau of Animal Industry Experiment Station at Bethesda.[3] In the experiments reported it was shown that B. C. G. is a strain of the mammalian tubercle bacillus, possessing a low virulence, if not avirulent. The strain has a demonstrated tuberculinogenic ability. In immunization tests with guinea pigs, these animals were apparently given some temporary resistance, but this did not last, as eventually every vaccinated animal died of tuberculosis. Similar tests with cattle were equally disappointing. In one experiment, when the vaccinated cattle were subsequently exposed by feeding virulent tubercle bacilli, those vaccinated showed more extensive lesions of tuberculosis than the untreated controls.

The best that can be said of the Calmette method, as shown by experiments thus far conducted in the United States and Canada, is that the progress of the disease is delayed in some cases. Immunity does not result, as measured by freedom from infection. Calmette and his associates are said to admit this fact. On the other hand, there are valid objections to the widespread use of the method. One great danger lies in the possibilities attending the creation of carriers of the infection which we are spending millions of dollars to eradicate. Another great objection is found in the possible, in fact, probable, interference with the various tuberculin tests now so generally used in our tuberculosis eradication campaign. In brief, the investigations we have cited strongly suggest that B. C. G. vaccination, in its present form, has little to offer in the campaign against bovine tuberculosis.

[2]Larson, W. P. and Evans, W. A.: A Two-year Experiment with the "Calmette" Method of Vaccination. Jour. A.V.M.A., lxxiv (1929), n.s. 27 (4), pp. 581-587.

[3]Schroeder, E. C. and Crawford, A. B.: Studies Concerning the Calmette-Guérin Method of Vaccinating Animals Against Tuberculosis. Jour. A.V.M.A., lxxiv (1929), n.s. 27 (5), pp. 773-782.

EXECUTIVE BOARD ELECTIONS

The election in Executive Board District No. 2 came to a close on March 12, 1929. The Board of Tellers, consisting of Drs. Reuben Hilty and Warren P. S. Hall, of Toledo, Ohio, Dr. John Hoberg, of Detroit, and the Secretary-Editor, canvassed the ballots and declared Dr. A. P. Althouse, of Sunbury, Pa., the winner. In November last, Dr. Althouse was appointed to fill the vacancy on the Executive Board created by the resignation of Dr. T. E. Munce, As the result of the election, Dr. Althouse will be the regular member of the Board to represent District No. 2 for the balance of the unexpired term of Dr. Munce.

The primary election in District No. 4 has been in progress since February 13, for the purpose of securing nominees for the election proper which will start at the close of the polls for nominations, on April 13. As is very frequently the case, the vote in this primary election is exceedingly light. Only a few more than 100 ballots had been cast by March 13, a month after the polls were opened.

Quite a few members located in District No. 4 have written in and asked why they did not receive ballots in the election being held in their District. In every case investigation disclosed that these members had not paid their 1929 dues. As long as these dues remain unpaid, a member is not eligible to participate in any election, under a strict interpretation of the By-Laws.

THE SECOND FLIGHT

The statistical analysis of A. V. M. A. membership strength in the half-dozen largest states, as well as the half-dozen smallest states, as published in the February issue of the JOURNAL, has stimulated considerable interest. Quite a few of our members have indicated a desire to know just where their states stand. We have decided to prepare additional analyses and this month we are presenting figures on what we have chosen to call the second flight of states.

In the first analysis we disposed of Iowa, California, Pennsylvania, Illinois, Ohio and New York, all of those six states having in excess of 250 members each. In the second flight we have included the eight states standing next highest in the list at the present time. The 1929 figures give effect to all applications for membership now on file. Some of these were given first listing in

the March issue of the JOURNAL and the others are listed for the first time this month.

It will be noted, from the accompanying table, that Minnesota has a rather commanding lead in first place in the second flight. Study shows that this position was gained very largely as a result of the meeting held in Minneapolis last year. Many Minnesota veterinarians took advantage of the opportunity to become affiliated with the A. V. M. A. at that time. Comparing the present membership strength of Minnesota with the number of members credited to that state in 1923, we find that the Gopher State has a very healthy increase of 59. It will be recalled that in the analysis of the six leading states we compared the figures of 1923 with those of the present year,

State	*1923*	*1929*	*Change*
Minnesota	134	193	+59
Michigan	129	171	+42
Indiana	167	170	+ 3
Missouri	157	128	—29
Kansas	161	116	—45
Wisconsin	109	114	+ 5
Texas	128	97	—31
Nebraska	121	85	—36

Michigan and Indiana are having a very close race for second position, with the Wolverine State leading the Hoosiers by a single member. Michigan's membership strength for 1929, however, shows a gain of 42 over the year 1923, as compared with a net gain of 3 for Indiana during the same period.

Missouri, Kansas, Wisconsin, Texas and Nebraska follow in the order named. Of these five states, Wisconsin is the only one to show a gain in membership since 1923. This gain is small, but puts the Badger State on the right side of the ledger. Undoubtedly Wisconsin was aided considerably by the meeting in Minneapolis last year, as quite a substantial number of new members were added during 1928.

In quite a number of the states, our resident secretaries have already launched vigorous membership campaigns. Others will be under way this month. The results will be most readily apparent in the applications listed in the JOURNAL from month to month. What has already been done in California has attracted nation-wide attention. In this connection, the fact should not be overlooked that little or no letter-writing has been done in California, but almost every one of the applications secured thus far has been through personal solicitation. Incidentally, it might

be mentioned that California has passed Iowa and is now comfortably occupying first place. Next month we will try to have ready the figures for the third flight of states, those having between 50 and 80 members each.

Eastern States Tuberculosis Conference

Dr. E. A. Crossman, of Boston, Massachusetts, has announced that the 10th annual conference on tuberculosis eradication and live stock diseases for the eastern states will be held at the Municipal Auditorium, Springfield, Mass., June 18-19, 1929. A program is being prepared which will be of interest to farmers, dairymen, public health officials and veterinarians, according to Dr. Crossman. The conference is to be given wide publicity through the Springfield Chamber of Commerce and it is believed that there will be a large attendance of interested people from all of the eastern states. A more extended announcement concerning the program will be published in a later issue of the JOURNAL.

APPLICATIONS FOR MEMBERSHIP

(See December, 1928, JOURNAL)

FIRST LISTING

ANDERSON, A. R. 5956 Van Nuys Blvd., Van Nuys, Calif.
D. V. S., United States College of Veterinary Surgeons, 1903
Vouchers: W. L. Curtis and J. P. Bushong.

ANDERSON, OTTO CARL 208 Griswold Rd., Northville, Mich.
D. V. M., McKillip Veterinary College, 1915
Vouchers: H. Preston Hoskins and John Hoberg

BELLER, LEONARD IVEN 10316 Long Beach Blvd., Huntington Park, Calif.
D. V. M. St. Joseph Veterinary College, 1918
Vouchers: W. L. Curtis and J. P. Bushong.

BOOMER, JOHN B. 530 Fulton St., San Francisco, Calif.
M. D. V., McKillip Veterinary College, 1897
Vouchers: Oscar J. Kron and Joseph M. Arburua.

COZZENS, JOSEPH D. 2121 Pico Blvd., Santa Monica, Calif.
D. V. M., Ohio State University, 1925
Vouchers: W. L. Curtis and J. P. Bushong.

CROSS, FLOYD 711 Mathews St., Fort Collins, Colo.
D. V. M., Colorado Agricultural College, 1914
Vouchers: Geo. H. Glover and I. E. Newsom.

DOWD, GERALD R. James Law Hall, Cornell University, Ithaca, N. Y.
D. V. M., Kansas State Agricultural College, 1925
M. S., Cornell University, 1928
Vouchers: Alexander Zeissig and W. A. Hagan.

EDMUNDS, COLONEL E. Orlando Ave., Ardsley, N. Y.
V. S., Ontario Veterinary College, 1906
D. V. S., New York-American Veterinary College, 1908
Vouchers: Leland D. Ives and Robert S. MacKellar.

FARQUHARSON, JAMES Veterinary Hospital, Fort Collins, Colo.
D. V. M., Colorado Agricultural College, 1921
Vouchers: Geo. H. Glover and I. E. Newsom

GARBUTT, RAYMOND J. 24th St. and Avenue A, New York, N. Y.
D. V. M., New York University, 1921
Vouchers: C. G. Rohrer and J. Elliott Crawford.

HARRISON, JAS. B. 3854 Federal Blvd., Denver, Colo.
D. V. M., Colorado Agricultural College, 1927
Vouchers: Geo. H. Glover and I. E. Newsom.

HOYT, FLOYD E. Central Square, N. Y.
D. V. M., Cornell University, 1918
Vouchers: V. A. Moore and P. A. Fish.

JENSEN, WALTER DANIEL Grant, Nebr.
D. V. M., Kansas City Veterinary College, 1914
Vouchers: C. H. Hays and Floyd Perrin.

KLINE, GEORGE JOHN 23410 Woodward Ave., Ferndale, Mich.
D. V. M., Grand Rapids Veterinary College, 1914
Vouchers: L. H. LaFond and E. E. Patterson.

LEE, WARD ROYAL Box 338, Sacramento, Calif.
D. V. M., Kansas City Veterinary College, 1916
Vouchers: Rudolph Snyder and W. L. Curtis.

LITTON, CLYDE T. 345 E. Redondo Blvd., Inglewood, Calif.
D. V. M., San Francisco Veterinary College, 1915
Vouchers: W. L. Curtis and J. P. Bushong.

LOCKE, GEO. H. Lockeford, Calif.
D. V. S., University of California, 1898
Vouchers: A. C. Rosenberger and J. P. Iverson.

MCCORMICK, THOMAS JOSEPH 2043 19th Ave., San Francisco, Calif.
D. V. M., Chicago Veterinary College, 1920
Vouchers: Joseph M. Arburua and John McInnes.

MCFARLAND, RAY A. 907 9th Ave., Monrovia, Calif.
D. V. M., McKillip Veterinary College, 1913
Vouchers: W. L. Curtis and E. P. Schaffter.

MILLER, WILLIAM TAYLOR 210 Delaware Ave., Ithaca, N. Y.
D. V. M., Kansas State Agricultural College, 1924
Vouchers: Peter Olafson and W. A. Hagan.

MUNRO, ALEXANDER DUNCAN Petaluma, Calif.
D. V. M., San Francisco Veterinary College, 1918
Vouchers: Joseph M. Arburua and John McInnes.

POOLE, HIRAM L. 237 Linden Ave., Long Beach, Calif.
M. D. C., Chicago Veterinary College, 1906
Vouchers: W. L. Curtis and J. P. Bushong.

POPE, IRA S. 531 Burnham Road, Elizabeth, N. J.
V. M. D., University of Pennsylvania, 1911
Vouchers: Leland D. Ives and J. Hubley Schall.

STURM, GEORGE ARTHUR Bad Axe, Mich.
D. V. M., Michigan State College, 1926
Vouchers: M. P. Hunt and B. J. Killham.

SWARTZ, RUSSELL PHILLIP 436 San Fernando Rd., Los Angeles, Calif.
V. S. B. V. Sc., Ontario Veterinary College, 1925
Vouchers: W. L. Curtis and J. P. Bushong.

WELLER, EMIL EMANUEL 53 Park Place, New York, N. Y.
D. V. S., United States College of Veterinary Surgeons, 1912
Vouchers: Leland D. Ives and James R. Kinney.

Applications Pending

SECOND LISTING

Beck, Walter H., 722 State Office Bldg., Lansing, Mich.
Bingham, Francis S., 824 Topeka Ave., Topeka, Kans.
Booth, Russell Berkins, 148-15 Hillside Ave., Jamaica, N. Y.
Childs, John W., 13476 Washington Blvd., Venice, Calif.

Cook, Lewis J., 816 S. San Pedro St., Los Angeles, Calif.
Duckworth, Charles Underwood, Capitol Bldg., Sacramento, Calif.
High, Floyd W., 901 College Ave., Mt. Pleasant, Mich.
Huggins, Matthew James, Edwardsville, Ill.
Jacks, James P., 615 San Fernando Bldg., Los Angeles, Calif.
Kimnach, Gustav Henry, Hightstown, N. J.
Logan, A. Floyd, Box 49, Mt. Clemens, Mich.
Madell, Walter J., 422 Hill St., Jackson, Mich.
Mills, Horace Arthur, Johnson Hotel, Salem, N. J.
Morris, Mark Loren, Lincoln Highway, Stelton, N. J.
Murray, Benjamin Frank, 5331 College Ave., Oakland, Calif.
Pinkham, Chas. F., Throop Hotel, Topeka, Kans.
Ross, Kenneth, 3800 Grand River Ave., Detroit, Mich.
Ross, W. J., 2649 Walnut, Huntington Park, Calif.
Seevers, Harry, 5614 East Michigan St., Indianapolis, Ind.
Stagner, Albert Henry, Hudson, Ill.
Stone, Raymond V., 829 S. 6th St., Alhambra, Calif.
Thomas, Chas. A., 1212 Reed St., Kalamazoo, Mich.
White, Charles B., Stanford, Ill.
Willie, Roy Emil, c/o Y. M. C. A. Rm. 408, Jersey City, N. J.

The amount which shall accompany an application this month is $8.75 which covers membership fee and dues to January 1, 1930, including subscription to the JOURNAL.

COMING VETERINARY MEETINGS

New York City, Veterinary Medical Association of. Academy of Medicine, 5th Ave. and 103rd St., New York City. April 3, 1929. Dr. Raymond J. Garbutt, Secretary, 305 W. 91st St., New York, N. Y.

San Diego-Imperial Veterinary Medical Association. San Diego, Calif. April 3, 1929. Dr. A. P. Immenschuh, Secretary, Santee, Calif.

Chicago Veterinary Society. Great Northern Hotel, Chicago, Ill. April 9, 1929. Dr. J. B. Jaffray, Secretary, 1956 Washington Blvd., Chicago, Ill.

Kansas City Association of Veterinarians. New Baltimore Hotel, Kansas City, Mo. April 9, 1929. Dr. J. D. Ray, Secretary, 400 New Centre Bldg., Kansas City, Mo.

Maine Veterinary Medical Association. Congress Square Hotel, Portland, Me. April 10, 1929. Dr. C. F. French, Secretary, 87 Summer St., Rockland, Me.

Southeastern Michigan Veterinary Medical Association. Board of Health, Detroit, Mich. April 10, 1929. Dr. H. Preston Hoskins, Secretary, 716 Book Bldg., Detroit, Mich.

Southern California Veterinary Medical Association. Chamber of Commerce Bldg., Los Angeles, Calif. April 17, 1929. Dr. W. L. Curtis, Secretary, 1264 W. 2nd St., Los Angeles, Calif.

INVESTIGATIONS ON ANAPLASMOSIS IN CATTLE*

GEO. W. STILES, *Denver, Colo.*

Associate Bacteriologist, Pathological Division,
Bureau of Animal Industry, U. S. Department of Agriculture

INTRODUCTION

The recent disclosure that a cattle disease similar to Texas fever exists in our country, above the fever quarantine line, gives occasion for study into the nature and distribution of the malady now recognized as anaplasmosis.

Investigation shows that it has probably existed in sections of the United States for a number of years, one veterinarian expressing his belief that anaplasmosis was present, but unrecognized, in northeastern Oklahoma for the past 20 to 25 years.

It was not until the summer of 1927 that the number of cases in Kansas and Oklahoma became so numerous that an appeal was made to the federal government to assist in making a study of the disorder. The writer was detailed by the Bureau of Animal Industry to visit the afflicted areas and obtain all the evidence possible in order to shed light on this, another new pest invading our country. Several months were spent gathering data pertaining to this disease, consulting veterinarians, state and federal officials, college professors, live stock owners, and others directly interested in the subject. It is the writer's belief that a death loss of approximately $1,000,000 was suffered last year in the two states visited; hence the urgency of an intensive campaign to ascertain the factors involved in spreading the disease; and of finding effectual means of preventing its further dissemination. Owing to the possibility of wild life harboring insects that carry disease germs, the following animals, birds and reptiles were destroyed to study their parasitic life: wood-rats, mice, moles, gophers, skunks, owls, hawks, crows, bluejays, pigeons, blackbirds, meadow larks, sparrows, swallows, doves, snakes and turtles. Many of the above creatures harbored lice and mites but no ticks.

DEFINITION

Anaplasmosis is an acute, sub-acute or chronic, febrile, infectious protozoan disease, characterized by sudden loss of flesh,

*Presented at the sixty-fifth annual meeting of the American Veterinary Medical Association, Minneapolis, Minn., August 7-10, 1928.

labored breathing, suspension of milk-flow, anemia, jaundice and marked degenerative changes in the red blood corpuscles due to activity of *Anaplasma marginale*. It is probably transmitted from sick animals to healthy ones through the medium of biting insects, ticks, flies, mosquitoes, lice, fleas or other unknown agents. The malady is sometimes described as "gall-sickness" (galziekte) and may be confused with Texas fever (*Piroplasma begeminum* infestation) or other forms of piroplasmosis in cattle.

Geographical Distribution

While this disease is primarily classed as a tropical or subtropical malady, being found in various sections of Africa, South America, island of Formosa, the Philippines, Italy and other European countries, it has been discovered existing in Florida, Louisiana, California, Nevada, Oklahoma and Kansas, also probably other southern states, although the extent of its prevalence in this country has not been fully determined. A digest of questionnaires sent to practitioners in Kansas, Oklahoma, Colorado, New Mexico and Arizona, shows the following:

Kansas: Anaplasmosis was reported present during 1927 in 25 of the 105 counties, as follows: Allen, Anderson, Bourbon, Butler, Chautauqua, Cowley, Crawford, Douglas, Elk, Franklin, Greenwood, Harper, Harvey, Jefferson, Kingman, Labette, Leavenworth, Montgomery, Neosho, Osage, Reno, Riley, Sedgwick, Sumner and Wilson. Of the 92 reports received from practicing veterinarians, 22 report 487 cases, with 208 deaths, or about 43 per cent mortality.

Oklahoma: Anaplasmosis was reported present during 1927 in 25 of the 77 counties, as follows: Alfalfa, Blaine, Cherokee, Craig, Garfield, Kay, Kingfisher, Logan, Mayes, Noble, Nowata, Oklahoma, Okmulgee, Osage, Ottawa, Pawnee, Payne, Pittsburg, Pottawatomie, Rogers, Tulsa and Washington. Of the 35 reports received from practitioners, 20 report 191 deaths and 474 cases, or a mortality of 40 per cent. Averaging the loss in Kansas, the general mortality is about 42 per cent, which in either state is necessarily incomplete. A mortality of about 40 per cent is reported from Florida.

Nevada. Two outbreaks of anaplasmosis are known to have occurred in Nevada. Through correspondence with Dr. L. R. Vawter, Reno, Nevada, a case history of seven dead cattle, with five recoveries from a herd of 80 Hereford cattle occurred during the year 1926. These cattle were shipped from near Monterey,

California, into Nevada and a diagnosis of anaplasmosis was made by Dr. W. H. Hilts, District Veterinarian, Elko, Nevada, and confirmed by Dr. Vawter, and Drs. W. H. Boynton and K. F. Meyer, of the University of California.

A second outbreak of anaplasmosis came to the attention of the writer during January, 1928, through the courtesy of Drs. Hilts and Vawter. The essential feature of this outbreak was a death loss of 13 head, with 22 recoveries. These cattle were natives, two and three years old, mostly steers, and were raised in northern Nevada with a mixture from southern Utah. The interesting and remarkable feature of this outbreak was the death loss in the herd following dehorning, no cases occurring among those which were not dehorned. The history shows 340 animals were operated upon, December 1-3, 1927, and 42 days later an explosive outbreak of anaplasmosis developed within a period of one week.

Laboratory findings by Dr. Boynton were confirmed by the writer, which sustained the autopsy findings made by Drs. Vawter and Hilts. From the above investigation, the writer concluded there were one or more unrecognized "carriers" in this herd of cattle, and that the process of dehorning was the mechanical means of transmitting the disease from sick animals to healthy, non-infected ones, as no antiseptic was used during dehorning. This view was also independently expressed by the other investigators who worked on this outbreak. The question of a vector, or insect carrier, such as ticks, flies or mosquitoes, could probably be eliminated in this case, unless the incubation period was extremely long, as the disease occurred during the long winter season when insect life was inactive.

Questionnaires sent to veterinarians of Colorado show the possible existence of a disease in the southeastern part of the State somewhat similar to anaplasmosis; also on the western slope, one herd in each area, although not definitely confirmed by adequate laboratory findings. Scattered reports from New Mexico and Arizona fail to show the disease prevalent in those localities. Anaplasmosis occurs more often during the months of July, August, September and October, although sporadic cases may develop any month of the year.

Review of Literature

Smith and Kilborne,[1] in 1893, observed coccus-like bodies located marginally in red blood cells during their studies on Texas

fever, which were considered developmental stages of *Piroplasma bigeminum*. After nearly 17 years, Theiler[2] announced that the marginal bodies belonged to a distinct species which he named *Anaplasma marginale*. Dr. Karl F. Meyer,[3] in 1913, appears to have been the first investigator to record experimental evidence of anaplasmosis in this country; his observations were made in tick-free areas during winter months and his cattle never came into contact with ticks. A cow inoculated with blood from a Texas fever case from Florida developed anaplasmosis in 26 days and died on the thirty-third day. During 1927, Meyer[4] reports spontaneous cases of pure infestation of anaplasmosis in California.

In his recent report, Dr. W. H. Boynton[5] definitely proves that anaplasmosis is present in California, and that the incubation period is approximately eighteen days, and the mortality is highest in heavy-producing milk cows; that the exact mode of transmission is unknown, and the blood of a recovered case produced anaplasmosis when injected into a susceptible animal.

Dr. Paul B. Darlington,[6] in 1926, published an excellent article on this disease as prevalent in southeastern Kansas and his description of the malady and autopsy findings correspond with those of the writer. Dr. Darlington records the probable existence of anaplasmosis for a number of years in his locality.

Etiology

Anaplasma marginale (Theiler), a small "coccus-like" body found principally in the marginal borders of invaded red blood cells, is considered the exciting cause of this disease, although this view may be modified by subsequent observations. In his work on gall-sickness, Hoare[7] calls attention to other protozoan forms which are discussed in connection with anaplasmosis. The anaplasma parasite appears to be distinct from *Piroplasma begeminum* of Texas fever (red water in American cattle), although it is probable the two parasites have heretofore been confused in the study of the latter disease, as noted by the work of Smith and Kilborne[1] and other writers.

Description of the Parasite

Classical description of *Anaplasma marginale* shows the protozoa as minute, coccus-like bodies generally located in the margin of the infested red blood cells, although occasionally the organisms are found centrally, or even free in the blood plasma. Dr. Boynton[5] calls attention to the possibility of double infection with

A. centrale in the same animal. The study of stained smears from afflicted cattle indicates the parasite possibly multiplies by fission, as evidenced by diplococcoid forms, also by the presence of large numbers of parasites (possibly mast cells or hematin granules) being found in certain cells during various stages the disease. This phase of the subject requires further study in order to determine more clearly the life history of the organism.

The accompanying photograph (fig. 1) of a drawing made by the author from a Jersey cow affected with the disease in Oklahoma illustrates some of the points under discussion. Many cells

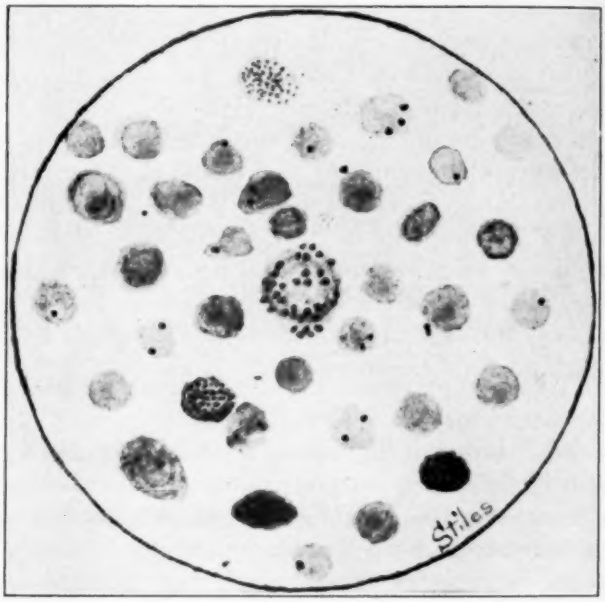

FIG. 1. *Anaplasma marginale* in blood film.

contain one or more visible parasites, others two, and occasionally three are noted in a single cell, apparently the beginning of cell invasion. An eosinophile is shown in the center of the drawing.

PATHOLOGY OF THE AFFECTED RED CELLS

Well-prepared, stained blood-films from cows visibly afflicted with an aplasmosis often show variable pictures of the malady with reference to the blood pathology. The anemia present is doubtless due to the destruction of red blood corpuscles. It will be observed that the invaded cell becomes thin in appearance, distorted in outline, irregular in shape, with poikilocytosis,

polychromasia, and other changes which account for the watery-like appearance of the blood. Actual count of a sick cow in Oklahoma showed 1,500,000 red cells per cu. mm. present, as contrasted with 9,000,000 red cells in a healthy animal in the same locality. White cells enumerated in the sick cow were 9,000. The author has observed twenty to thirty per cent or more of cells showing the parasite present in well-developed cases, with the hemoglobin (T.) index reduced to 20 per cent in severe cases. There may also be noted an increase of blood platelets present in this disease. Owing to the very great diminution of red cells, one can explain the pallor and anemia seen in cows suffering from this disease; likewise the distressed circulatory involvement.

Slides for microscopic study of the sick animals should be made on well-cleansed glass, thinly spread, and the films should be quickly dried to prevent excessive crenation. Wright's blood stain, Leishman's, Jenner's and Giemsa's are satisfactory for ordinary observations; special methods may be employed to bring out individual features. With the recovery of sick animals the parasite diminishes in numbers in the cells, and the number of cells involved becomes less over a variable period of time. Experiments at the Oklahoma A. and M. College, Stillwater, made by Drs. E. E. Harnden and Harry W. Orr, showed the parasite present in diminishing numbers in a cow recovering from the disease after observation for about six weeks. These same veterinarians are responsible for making the blood counts of a healthy and of a sick cow.

Animal Inoculations

(a) A yearling Jersey bull received 20 cc of defibrinated blood from a freshly dead cow, subcutaneously in the neck, on October 7, 1927. Prior to inoculation the bull's blood failed to show any parasites present, temperature was 102° F. and the animal appeared normal in every respect. Fifteen days later, a few parasites were visible in the blood, but no symptoms of illness were evident. On November 1, twenty-four days later, this animal's temperature was 105.8° F. and increase in the apparent number of parasites was seen but no icterus was observed. Later observations indicate complete recovery of this animal (Jan. 13, 1928), 98 days after injection. Adult cattle are desirable for inoculation experiments, as they appear to be more susceptible than calves.

(b) Two rabbits were injected, one with 2 cc of blood subcutaneously; the other with a spleen emulsion intraperitoneally from a cow dead of anaplasmosis. One month later both of these animals showed coccus-like bodies present in their blood, possibly "Jolly's bodies," or Anaplasma parasites. The spleen case, 44 days later, appeared sick with a temperature of 103° F. After 100 days, the temperature was 102.4° F., hemoglobin 70 per cent, with from one to three coccus-like bodies in an occasional red blood cell. This rabbit died 113 days after inoculation, probably from snuffles; the other rabbit also died, August 13, 1928, from pneumonia.

(c) Two guinea pigs each received 0.5 defibrinated blood of an infected cow; one subcutaneously, the other intraperitoneally. Microscopic examinations ranging over a period of 100 days showed a few coccoid bodies present in the blood corpuscles, but temperatures remained about normal and their general appearance was little changed; hemoglobin 80 per cent.

Theiler and Meyer both failed to reproduce the disease from Berkefeld filtrates of blood containing numerous Anaplasma.

At Washington, D. C., a cow receiving 4.5 cc blood from a Florida case (sent in a thermos bottle packed in ice) showed parasites in her blood after 32 days, with temperature elevation two days later. With a second passage of the virus, using 50 cc of blood intravenously, the marginal parasites appeared after 16 days; and with a third passage, 19 days, using 20 cc of blood. There is some evidence to show the period of incubation depends on the dosage and manner of infection.

Possible Means of Transmission

Ticks: Since anaplasmosis closely resembles Texas fever, it is usually considered tick-borne; however, this remains to be demonstrated. Theiler[2] succeeded in transmitting anaplasmosis experimentally by the blue tick (*Boophilus decoloratus*) and the black tick (*Rhipicephalus simus*), although most investigators report the disease in "tick-free" areas in this country. Boynton found a few wood ticks (*Dermacentor occidentalis*) and deer ticks (*Ixodes ricinus*) on cattle in California afflicted with anaplasmosis. Herms[8] says there are over forty species of ticks in the United States. Further information relative to ticks may be found in the work of Hunter and Hooker[9] in their exhaustive treatise on this subject. The evidence thus far obtained from questionnaires sent to all registered veterinarians in Oklahoma, Kansas, Colorado,

Arizona and New Mexico, and to other individuals, indicates that no ticks of any kind, except an occasional spinose or ear tick (*Ornithodorus magnini*), are found present on cattle suffering from anaplasmosis.

Notwithstanding its negative evidence of tick infestation on cattle sick of anaplasmosis, careful observations show the presence of the common dog tick (*Dermacentor variabilis*) occasionally on cattle not afflicted with the disease. A state live stock inspector for Oklahoma reports only one or two ticks observed on 500 to 600 head of cattle inspected. Occasionally herds coming from certain southern localities show approximately 10 per cent infestation with star-back ticks (*Amblyomma americanum*). Hunting dogs running in brushy, wooded territory show heavier tick infestation than dogs observed on prairie lands. This was true also with the rabbits examined, and with horses and mules.

TABLE I—*Animals inspected by the author with regard to tick eradication.*

ANIMAL	NUMBER EXAMINED	SHOWING TICKS	VARIETY
Cattle*	372	12	*Dermacentor variabilis* (dog tick)
Cotton-tail rabbits†	164	70	*Haemaphysalis leporis-palustris*
Dogs (farm and town)	141	70	*Dermacentor variabilis*
Sheep (old and young)	27	2	*Dermacentor variabilis*
Horses (farm)	18	5	*Dermacentor variabilis*
Jack rabbits	16	2	*Haemaphysalis leporis-palustris*
Goats (town-lot type)	14	0	
Squirrels	13	3	*Dermacentor variabilis*
Cattle‡	10	10	*Ornithodorus megnini*
Coyotes (young and old)	10	10	
Opossum (young)	7	0	
Opossum (adult female)	1	1	*Haemaphysalis leporis-palustris*

*One cow dead of anaplasmosis was reported by Dr. J. T. Wilson, Pawnee, Okla., as showing one gravid female tick on the animal three weeks before the onset of the illness. Another cow, sick with this disease, reported by Dr. C. C. Nickel, Nowata, Okla., showed a gravid female tick two weeks before the onset of the illness. These ticks were considered to be the common dog variety (*D. variabilis*).

†Includes 69 cotton-tail rabbits, of which 27 showed ticks, 8 jack rabbits, one with ticks, and 10 coyotes, all killed in a rabbit drive, reported by J. W. Chaffin, County Agent, Nowata, Okla.

‡Showing spinose ear ticks.

W. E. West, County Agent, of Bartlesville, Oklahoma, reports one lot on which about 50 per cent of Brahma cattle, unloaded in his vicinity last April, showed ticks, presumed to be *D. variabilis*. Two mules out of five examined had ticks; seven dogs out of twelve showed ticks; one rabbit in three had ticks in its ear; five out of eighteen native cows showed ticks; and one buffalo showed a single tick at the base of the ear.

In one herd of about 45 adult cattle in Oklahoma, 23 cases of anaplasmosis appeared during 1927, with 9 deaths and 14 re-

coveries. During the spring of 1928, the writer inspected 9 of the 14 recovered cows and found 5 with dog ticks, from one to three per cow.

The following is a list of ticks found in Oklahoma, as reported by Dr. L. J. Allen, Inspector-in-Charge, Bureau of Animal Industry, Oklahoma City, Oklahoma:

Margaropus annulatus (fever tick)
Dermacentor nigroliniatus (brown-legged)
Dermacentor variabilis (dog tick)
Ixodes scapularis (black-legged)
Ixodes bruneus (bird tick—sparrows. Uncommon)
Amblyomma americanum (star tick)
Argas miniatus (chicken tick)
Haemaphysalis leporis-palustris (rabbit tick)
Ornithodorus megnini (ear tick).

The type of country in which anaplasmosis occurs is favorable for the propagation of ticks, likewise for many other insects. Dense wooded areas with abundant underbrush, old dead grass, abundant water, land frequently overflowed by floods, and a warm, humid climate, together with numerous rodents as hosts furnish ideal conditions for tick life. The author suggests the possibility of the Argas, or night marauder type of tick or insect, as a further item of study, which may prey on cattle only during darkness. Should such a theory be proven, then the absence of ticks on sick cattle observed during the daytime would be explained.

Ticks from cotton-tails[15] (*Haemaphysalis leporis-palustris*) have been proven capable of transmitting Rocky Mountain or spotted fever from one rabbit to another. The *Dermacentor venustus* has been heretofore considered the only species of tick which could transmit this disease to man. In referring to the concentration of the spotted fever virus in the eggs of *Dermacentor venustus*, Spencer[10] states that one egg from an infected tick is sufficient to infect a guinea pig and that the average egg weighs .06 milligram or .00006 gram.

Flies: According to Prof. C. E. Sanborn, entomologist, Oklahoma A. and M. College, there are a number of flies prevalent in Oklahoma which feed on cattle, and the evidence shows these insects were unusually severe during the summer and autumn of 1927. Three varieties of the large horse flies (Tabanidae), the horn (*Hematobia serrata*), stable (*Stomoxys calcitrans*), warble

(*Hypoderma lineata*), screw worm (*Chrysomyia macellaria*) and other varieties were observed to be present in large numbers on cattle last year, causing much annoyance and economic loss from their ravages, aside from being possible carriers of *Anaplasma marginale* from afflicted to healthy cattle. The writer detected anaplasmosis parasites in undigested blood corpuscles in greenhead and stable flies caught feeding on sick cattle. Flies were particularly severe in biting unprotected areas often causing the blood to ooze around the umbilicus and the root of the tail in milk cows.

Under date of August 7, 1928, Dr. Sanborn suggests the question of fly transmission in anaplasmosis as a very important subject for further investigation. He quotes as follows from W. Dwight Pierce (*Sanitary Entomology*, p. 209 and 210, 1919), under the head of "Plant Organisms Carried by Bloodsucking Flies"—"Diseases Transmitted by Bloodsucking Flies":

> *Bacterium anthracis* Davaine, the causative organism of anthrax or charbon, can be carried by bloodsucking flies. Nuttall (1899) cites many early references to the role of bloodsucking flies in the transmission of anthrax, the earliest being by Montfils in 1776. Hintermayer (1846) studied an epidemic which raged among the deer in the Park of Duttstein. The horse flies, *Tabanus bovinus* Loew, *Haemotopota pluvialis* (Linnaeus), and *Chrusops coecutiens* (Linnaeus) assembled usually in thousands on the carcasses of the fallen animals and sucked the profluvia which escaped from the mouth, nose, and vent. Leaving the bodies they immediately sought the healthy animals, thrust their proboscides soiled with the virus into the skin and in this way inoculated the poison of the disease. Mitzmain (1914) proved that *Tabanus striatus* Fabricius and the stable fly, *Stomoxys calcitrans* Linnaeus, can transmit the disease by their bites. Schuberg and Kuhn (1912) transferred anthrax infection from a cadaver to a living animal through the bite of *Stomoxys calcitrans*.
>
> Morris (1918) working on anthrax in Louisiana proved that the horn fly *Lyperosia irritans* Linnaeus (*Haemotobia*) when biting an infected guinea pig four hours or less before its death and up to fifteen minutes after death can transmit infection. One hundred and eighty-four experiments on different guinea pigs were made during these time limits and infection was conveyed in 34 per cent of the cases. Forty experiments outside of these time limits were unsuccessful. One out of two tests with the flies feeding on an infected sheep thirty minutes before death yielded infection in a guinea pig, and all tests of biting in the quarter hours before and after death of the sheep yielded infection in guinea pigs.
>
> He also tested a species of Tabanus and proved transmission in 40 per cent of 70 cases in which the flies bit between four hours before death and five minutes after death. Virulent cultures of anthrax were obtained in nature by Morris from *Tabanus atratus* Fabricius caught feeding on a carcass. This species will feed on a carcass thirty minutes or more after death.
>
> He likewise determined the spores in the feces of the Lyperosia up to six hours after feeding, of the Tabanus one to twelve hours after feeding, and of mosquitoes 48 to 72 hours after feeding.
>
> The above cited evidence should be sufficient to emphasize the absolute necessity of isolating and protecting from bloodsucking insects, animals sick with anthrax. Valuable animals should likewise be kept in screened buildings during outbreaks of the disease.

Dr. Francis[16] and his associates of the U. S. Public Health Service have demonstrated by experimental evidence that tularemia can be transmitted by *Chrysops discalis*, a bloodsucking fly which attacks both man and beast. It is a well-known fact among veterinarians that biting flies transmit anthrax from affected to healthy animals; bed bugs transmit typhus fever, and other examples of similar means of infection are recognized in both man and the lower animals. The possibility of anaplasmosis being transmitted by the heel, or ox warble, fly is worthy of serious consideration; the screw-worm fly may be classed in the same category.

During July, 1928, the author had a splendid opportunity to witness the ravages of horse flies on cattle sick of anaplasmosis in Oklahoma. Large numbers of these pests were seen biting helpless cows and, upon being driven from the animal, left small rivulets of blood issuing from the wounds. These same flies attacked the writer in the woods while hunting for a sick cow. Dr. C. E. Sanborn has a group of these flies for classification at the present time.

Dr. L. T. Giltner injected an emulsion of infected Tabanidae received from Florida into a calf at Washington, D. C., with negative results, after observation for 31 days. The question as to how long a fly may remain infectious, if subsequently proven so, remains to be demonstrated. Digestion, and other factors, may prove this period very short, hence their shipment for a long distance could easily destroy the parasite if carried by these insects. Dr. Boynton[5] expresses the opinion that Tabanidae may be active factors in spreading anaplasmosis. Dr. W. B. Herms believes that these flies may be factors in spreading disease, although no definite proof is submitted to substantiate this belief. In Texas, campaigns to eradicate flies by means of traps are bringing excellent results; this method should be supplemented with better farm sanitation to prevent their development.

Mosquitoes: Owing to the severe floods last year and the increased rainfall, favorable conditions were afforded the excessive multiplication of this insect in certain infected localities. Prof. Sanborn, after making a general survey of the northeastern section of Oklahoma and southeastern Kansas, informs the writer that he is impressed with the possibility of the mosquito also being an active factor in spreading anaplasmosis.

If flies and mosquitoes are active factors, one would expect a more widespread distribution of anaplasmosis in individual

herds, also in herds on adjoining premises, although only certain species may be involved and their range of activity may be limited. It is quite common to find a herd of cattle afflicted on one side of a common barbed-wire fence, and a herd similar in kind, age and numbers, on the opposite side, to escape entirely. The same may be said of individual herds, perhaps only a single cow in a group may become infected, while all other members remain well and healthy, yet flies and mosquitoes freely operate among the entire herd.

Lice: During the month of February, 1928, the writer observed numerous lice on an animal with anaplasmosis in a Kansas herd. Specimens of these shortnosed (*Hematopinus eurysternus*) lice were macerated and injected into a guinea pig two days after removal from the host. Eleven days following injection, a few piroplasma-like bodies were observed in the pig's red blood cells; 16 days after inoculation the guinea pig's temperature was 103.8° F.; hemoglobin, 60, with one to four cells per field, showing coccoid bodies resembling Anaplasma; about one month later these parasites or bodies had apparently disappeared and the pig seemed normal again in every respect. The writer believes the "vector" occupies a limited range of activity, and that lice could be a potent factor in the spread of the disease. To offset this opinion, evidence shows that lice are more numerous in the winter months when anaplasmosis is the least prevalent.

Other Insect Pests

Reports indicate that there is a veritable plague of rats in the regions where anaplasmosis prevails. These rats act as hosts for numerous insects. On one ranch in Kansas where the writer is making an intensive study of the new cattle plague, it is estimated that 1,000 rats have been killed this season. About the barns, sheds and outbuildings, they are multiplying at a tremendous rate. On the dead rats were found numerous fleas and lice, and also a mite which was observed only by confining the dead carcass in paper bags for several hours after death. These mites, identified by the Bureau of Entomology, are *Laelaps glasgowi* (Ewing) and they are very sensitive to light. Little is known of their habits as regards disease transmission. A photograph of this parasite is presented, as the writer considers these insects possible factors in the spread of disease. On many farms inspected and on which anaplasmosis exists, the owners complain of rat infestation during recent years.

Buffalo gnats are sometimes very annoying and are found in regions where cattle are afflicted. Chiggers or harvest mites were observed on some rabbits killed during July in Oklahoma. The writer protected himself against their activity by the liberal use of powdered sulphur about the clothing. On one farm in Nowata County, Oklahoma, where the cattle disease prevailed last year, a "blue bug," a species of insect resembling bed bugs, was observed in all stages of development under the bark of oak logs used to make a corral. Dr. Sanborn reports these insects live on vegeta-

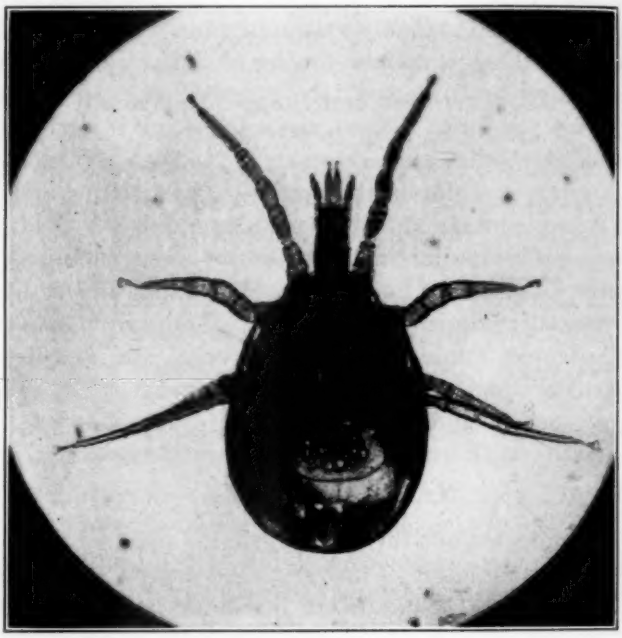

FIG. 2. A biting mite *Laelaps glasgowi* (Ewing) from a rat (Kansas).

ble matter and have no part in affecting animal life. They belong to the family Aradidae.

EXPERIMENTAL EVIDENCE NECESSARY

Properly controlled experiments with the various ticks, flies, mosquitoes, lice and other insects will be necessary to fix definitely the responsibility of the vector in anaplasmosis. Adult cows, free from disease, should be used for such experiments. They must be rid of insect life before artificial infection and kept under screened, fly-proof conditions; fed, watered and cared for

by competent help; and held under observation as to temperature, blood smears, hemoglobin and other blood tests for a period possibly of many weeks. All this requires time, finances and favorable opportunity to secure infected insects and material.

Carriers

There is increasing evidence among investigators of animal diseases that upon careful observation and study one can often find carriers in almost any species of fowl or animal which may be responsible for harboring a given disease, whether parasitic or bacterial.[11] Dr. Giltner states that sheep may harbor Anaplasma for several months without showing fever or other symptoms of illness, yet they are non-susceptible to Texas fever. Repeated passage of the virus through different animals of the same species apparently does not increase its virulence. In this investigation it has been shown that convalescent cattle and experiment animals harbor the parasite for variable periods of time. Dr. C. C. Hisel, Oklahoma State Veterinarian, reports six out of eleven cases in a dairy herd showed Anaplasma, although only two cows had died and it was not suspected the others were carriers of the parasite. Similar experiences have been encountered by the writer in a number of instances. Should such animals be shipped or moved from one locality to another, they could easily become potential possibilities of spreading the disease through the medium of biting insects, provided subsequent investigations prove such agents are positive factors in this respect.

Symptoms

Hutyra and Marek[12] describe this disease as ushered in by high fever, great debility, labored respiration and very frequent heart action, followed by jaundice. The writer's observations, together with the data gathered from various practitioners, show the disease is largely prevalent in adult dairy or range cattle. Younger animals show infection less frequently. The disease is usually rapid in onset. Loss of appetite and marked emaciation are noted in affected animals. They become gaunt and weak with a sudden decrease in milk-production in lactating cows. Early in the malady, temperatures may be elevated to around 107° F., later normal to subnormal before death. Some cases exhibit rapid, tumultuous heart action, pulse rate of 120 per minute, breathing accelerated and labored, from 50 to 60 respirations per minute, breathing accelerated and labored, from 50 to 60 respirations per minute, probably due to severe toxemia and marked decrease in

blood cells. The skin, udder, teats, brisket, mouth, vagina, sclera of the eyes and all visible membranes become icteric, anemic and deathly pale in appearance. Pica, or a depraved appetite, is sometimes noted, with cessation of rumination and frequent lying down and a stiff gait, when walking.

Urination is frequent and dribbling in character, probably due to lack of tone or to irritability of the bladder muscles. The character of the urine is usually normal in color, although Dr. C. C. Nickel, Nowata, Oklahoma, reports nine cases of about 150 observed during 1927 in which he saw wine-colored or bloody urine. Dr. Hilts reports one case in Nevada showing bloody urine and the writer has seen this condition in about a dozen cases under treatment by Dr. A. H. Gish, at Eldorado, Kansas. Cases exhibiting discolored urine should receive additional study to determine if perchance some other factors are responsible for this condition. Cerebral symptoms are sometimes noted, the afflicted animals want to fight, or exhibit some other evidences of a disturbed nervous system. Muscular tremors of the neck, shoulders or flank are often seen. The bowels are usually constipated, especially before purgation, and the feces are streaked with a blood-tinged, bile-stained mucus. Glandular swellings and edematous appearance of the eyes together with a roughened coat are reported. Abortion in advanced pregnant cases is not infrequent. Death may follow soon after the symptoms are fully developed, or recovery slowly take place with restoration to normal conditions. There is some evidence which tends to show this disease may develop a second time in some animals.

Postmortem Findings

The writer autopsied several cases of anaplasmosis in cattle some hours following death. However, the data herein presented are from a single adult cow, which was owned by a client of Dr. John T. Wilson, Pawnee, Oklahoma, who assisted in making the necropsy. Hereford cow, 5 years old; her calf was weaned five weeks before; she was in good flesh, had excellent grass, and along with others was receiving a little cotton-seed cake preparatory to marketing. The cow was known to be sick three days; she appeared to have died just a few minutes prior to our finding her dead in the pasture.

Externally: The cow evidently died without a struggle. The hide was removed; no hemorrhages or evidence of external injury

noted. All visible tissues showed marked jaundice. No parasites were observed on this cow.

Internally: The lymphatic system revealed slightly enlarged, edematous, watery glands, without marked swelling or hemorrhagic appearance.

Thoracic cavity: The heart was probably enlarged, its surface well sprinkled with petechiae and marked endocardial and epicardial hemorrhages. The blood revealed antemortem clots; and was removed in long, ropy strings and masses from the veins, which was characteristic of this disease. It was thin, watery, pale, and appeared to show the presence of fatty-like bile pigmentation.

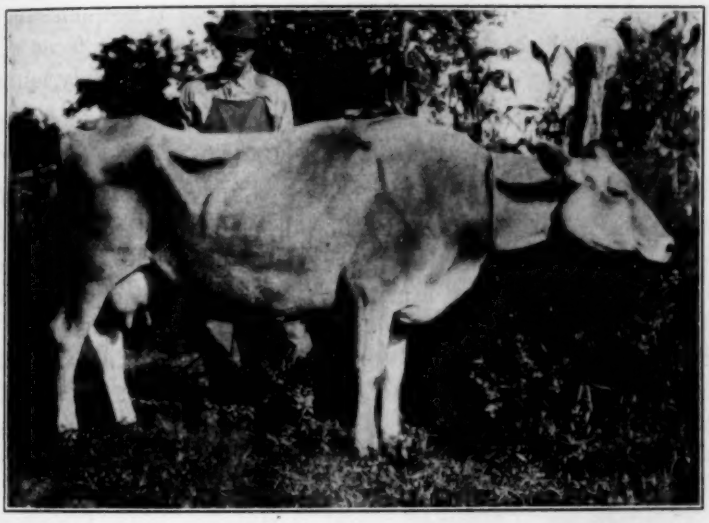

FIG. 3. A typical case of acute anaplasmosis (Oklahoma).

Hemoglobin index 20 per cent (T.). Numerous Anaplasma parasites were shown to be present in stained blood-smears. Lungs pale, anemic, bloodless in color, but they appeared to be infiltrated with air bubbles surrounding the interlobular spaces.

Abdominal cavity: Liver somewhat enlarged, hemorrhagic areas the size of one's thumb-nail on the surface; the viscus appeared saturated with bile. Bile-bladder at least five inches in diameter; it contained thick, flocculent, stringy, dark green, gelatinous-like contents. Externally the kidneys appeared normal aside from the tinge of icterus present; internally they were slightly congested. Spleen much enlarged; it weighed seven pounds; was thirty inches in length and 6½ inches in breadth. The consistency

of the spleen pulp was not fluid, but softened, darkened and degenerated. The author is indebted to Dr. T. A. Shipley, in charge of meat inspection, Denver stockyards, for observations on 56 normal adult cows' spleens on the killing-floor, the average weight being one pound, three ounces. Cultures both aerobic and anaerobic from the spleen of the anaplasmosis cow were negative. (This observation is in accord with the findings from other laboratories on similar cases.) Urinary bladder contained about two gallons of dark, straw-colored fluid, which upon testing showed traces of bile and sugar, with a specific gravity of 1018. No ocular evidence of hemoglobin noted. Two or three pin-point hemorrhages present on the mucous membrane. The gastro-intestinal tract showed a well-filled paunch, with the omasum or manyplies somewhat enlarged. Dry, hard masses of feces were noted in the large bowel, slightly streaked with a bloody mucus, showing a catarrhal enteritis.

Differential Diagnosis

Doubtless this disease is confused with Texas fever in quarantine areas, or it may be diagnosed as anthrax, hemorrhagic septicemia, gastro-intestinal disorders, forage poisoning, or, so-called by some, "dry murrain." Some observers have characterized anaplasmosis as "tickless Texas fever." A comparative microscopic study of blood-smears should aid in differentiating Texas fever from anaplasmosis. Fever ticks are not found in the latter disease. Lower temperatures may be noted in anaplasmosis, although this factor is not a realiable guide. In Texas fever cases the urine is practically always bloody, but this is the exception in anaplasmosis. Infected blood containing both Piroplasma and Anaplasma parasites, when injected into a susceptible cow, shows Texas fever reaction early, usually in eight to ten days, while the delayed febrile reaction, within three weeks to a month, is more likely to be that of anaplasmosis. However, the clinical and laboratory findings are not always sufficiently clear to distinguish one disease from the other. The writer believes much more work will be necessary to separate Texas fever from anaplasmosis. Anthrax and hemorrhagic septicemia should be easily distinguished by the presence of the specific organism isolated and tested by bacteriological investigations, including pure cultures of the organism and their pathogenic properties demonstrated by animal inoculation. The unwholesome character of the feed being consumed, its toxic principles, and the

symptomatology should be an index as to probable botulism or forage poisoning. As to dry murrain, this condition, known among certain practitioners and the laity, refers to the dry condition of the omasum which is usually normal for ruminants.

Treatment

Many veterinarians interviewed believed flushing of the bowels with saline purges should be indicated; others considered this useless or even contra-indicated, as such treatment would tend to weaken the patient further. The use of intravenous injections of very large doses of arsenical preparations, sold under various trade names, is considered advisable by most practitioners. Dr. A. H. Gish[13] recommends intravenous or intramuscular injection of sodium cacodylate in doses varying from 25 to 30 grains per hundred pounds weight of the animal to be treated. The dose may be repeated within three or five days as indicated. The administration of soamin, trypacrin, acriflavine, salvarsan, trypan blue, or other similar products are reported of value in some instances. Fowler's solution, in doses varying from one-half to one ounce, two or three times daily, in water or feed or by drenching, is recommended in convalescent cases. Stimulative treatment with strychnin and tonics to support the heart action, the use of blood parasiticides intravenously, the regulation of the gastro-intestinal tract, and good nursing are all indicated. Large quantities of saline solution introduced into the body subcutaneously, by the mouth, or rectum, may be of value to support the embarrassed circulatory system, and remove the toxic substances elaborated by the parasites. Medicated mineral oils are used by some veterinarians to regulate the gastro-intestinal tract. Quinin may be of value, but considered prohibitive in price.

Owing to the possible presence of hemorrhagic septicemia in herds also infested with anaplasmosis, the use of bacterins, serums or aggressins made for hemorrhagic septicemia might be indicated and of value in such herds. Some practitioners report favorable results from such vaccinations. It is probable that transfusion of normal defibrinated cow's blood from a donor to an infected animal would be of value in restoring such animals, provided the treatment was not too expensive. Cattle on ranges may die before the disease is noted; hence, the opportunity to treat such cases or control the malady is difficult.

Sergent[14] and his colleagues in Algeria have used a biologic product termed "incubation virus." The procedure consists of

injecting cattle with 50 cc of blood from a chronic or known-recovered case of anaplasmosis. After the fifth or sixth day of incubation, the injected animal is bled into 1 per cent sodium citrate solution and the blood is held at 12-21° C. (53.6-69.8° F.) for three days, when it is ready for use; from 2 to 5 cc are injected subcutaneously into animals to be immunized.

During 1927, in the Florida outbreak, Dr. A. D. Knowles, Kelsey, Florida, is reported as having treated nearly 1,000 cattle in infected areas in that state with somewhat encouraging results, although a report from the Bureau under date of July 13, 1928, indicates the results to date are unfavorable.

Theoretically, the ideal method of treatment is prevention. When the causative agent which carries the protozoon is discovered, then more satisfactory measures can probably be adopted to control or eliminate the disease. Perhaps there is more than one insect involved in transmitting the malady. Plans for conducting further investigation along these lines by the writer are now under way, subject to the approval of the Bureau.

Summary

1. Anaplasmosis in cattle exists in several localities in the United States and has doubtless been introduced into this country from tropical regions by means of "carriers."

2. The disease is characterized by sudden loss of flesh, labored breathing, suspension of milk-flow, anemia, jaundice, and marked degenerative changes in the red blood corpuscles.

3. The mortality in this malady varies in different herds, the average death loss is estimated at about 4 per cent of afflicted animals.

4. The symptoms and autopsy findings are similar to Texas fever, but fever ticks are absent, and other factors help differentiate the two diseases.

5. No specific treatment is available, although the use of various arsenical preparations, early in the disease, appears of value. Good nursing, tonics and restorative measures are indicated.

6. Numerous insects, including ticks, other than the Texas fever variety, biting flies, mosquitoes, lice, mites and other carriers of disease are under consideration, but as yet the specific vector has not been determined.

Acknowledgments

The writer is indebted to Dr. L. J. Allen, inspector-in-charge, Dr. W. L. Hiatt, in charge of tick control, Dr. J. Madsen, in charge of meat inspection, and other B. A. I. veterinarians located in Oklahoma City; also to Dr. C. C. Hisel, Oklahoma State Veterinarian, and his deputies; to the A. and M. College officials at Stillwater, Oklahoma, including Dean C. H. McElroy, his associates, Drs. E. E. Harnden and Harry W. Orr; Prof. C. E. Sanborn, entomologist, the latter having aided in the classification of insects, together with the U. S. Bureau of Entomology; also to Dr. R. R. Dykstra and his associates at the Kansas State Agricultural College, Manhattan, Kansas; Drs. L. R. Vawter and W. H. Hilts, of Nevada, and to the many practicing veterinarians, and Dr. J. S. Buckley, Chief, Pathological Division, B. A. I., Washington, D. C., all of whom rendered splendid service and cooperated in this investigation to the fullest extent.

The writer is also indebted to Dr. L. T. Giltner, Pathological Division, B. A. I., for some of the references to literature as reported in his paper[17] on "Anaplasmosis in Cattle in the United States," presented before the U. S. Live Stock Sanitary Association, in 1927. The author discussed Dr. Giltner's paper before veterinary meetings in Colorado, Oklahoma and Kansas. This report is a more complete discussion on the subject matter to date, July 28, 1928.

References

[1]Smith, T. and Kilborne, F. L.: Investigations into the nature, causation and prevention of Texas or southern cattle fever. U. S. Dept. of Agr., B. A. I. Bul. No. 1 (1893).

[2]Theiler, A.: *Anaplasma marginale.* Bul. Soc. Path. Exot., iii (1910), pp. 135-137.

[3]Meyer, K. F.: Die perniziose anamie der rinder. Cited by Kolle & Wassermann: Handbuch der Pathogenen Mikroorganismen, vi (1913), pp. 5-531.

[4]Meyer, K. F.: Die anaplasmosis der rinder. Idem, viii (1927), pp. 5-83.

[5]Boynton, W. H.: Observations on *Anaplasma marginale* (Theiler) in cattle of California. Corn. Vet., xviii (1928), 1, pp. 28-48.

[6]Darlington, P. B.: Anaplasmosis in cattle (galziekte). No. Amer. Vet., vii (1926), p. 39.

[7]Hoare, E. Wallis: A System of Veterinary Medicine (1913).

[8]Herms, William B.: Medical and Veterinary Entomology. (1st ed. New York, MacMillan Company, 1915).

[9]Hunter, W. D. and Hooker, W. A.: The North American fever tick. U. S. Dept. of Agr., Bureau of Entomology Bul. No. 72 (November 2, 1907.

[10]Spencer, R. R.: Experimental studies on the virus of Rocky Mountain spotted fever. Mont. State Board Health Bul. No. 26 (June, 1923).

[11]Nichols and Kelser: Carriers in Infectious Diseases (1922).

[12]Hutyra, F. and Marek, J.: Pathology and Therapeutics of the Diseases of Domestic Animals, i (1912).

[13]Gish, A. H.: Anaplasmosis in cattle, or a similar disease. Vet. Med., xxiii (1928), 3, pp. 106-109.

[14]Sergent, Donatien, Parrot, Lestoquard, Plantureaux and Rongebief. Estudes Experimentales sur les piroplasmoses bovines d'Algerie.

[15]Parker, R. R.: Amer. Jour. Trop. Med., iii (1923), 1.

[16]Francis, Edward: Tularaemia. Hygienic Lab. Bul. No. 130 (1922).

[17]Giltner, L. T.: Anaplasmosis of cattle in the United States. Jour. A. V. M. A., lxxii (1928), n. s. 25 (6), pp. 919-931.

SOME OBSCURE DISEASES OF SHEEP*

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I have been asked to present a paper before this section on the subject of obscure diseases of sheep. I am somewhat uncertain as to the degree of obscurity that may surround a disease to make it eligible for this discussion. However, I have selected a few diseases for consideration the etiology of which is more or less obscure, and which have been brought to my attention in the course of my work in a diagnostic laboratory. As my personal experience is limited to the western states, the conditions which I have chosen to discuss may have a somewhat sectional interest, and I shall probably fail to include some diseases which would be of greater interest to veterinarians from the eastern states.

At this time I have nothing to offer to help dispel the obscurity surrounding these particular diseases, but it may be of some value to review briefly the known facts in regard to these diseases. Due to the present comparatively high value of individual sheep and, in the western states, to the changes in methods of handling sheep, new problems are constantly arising, and the sheep industry today presents an opportunity for veterinary service, particularly along preventive lines. Therefore, a discussion of a few of the unsolved problems may be worth while in stimulating study which may help to render such veterinary service more effective.

PREPARTURIENT ECLAMPSIA

The disease which I shall consider first is a condition which is common to the East and the West, and is variously known as pregnancy disease, preparturient paresis, preparturient eclampsia, stercoremia, and acidosis of pregnant ewes. While this condition has been recognized for many years and has been described by a number of veterinarians in the United States and in Europe, there has not been an agreement as to the exact nature and etiology of the disease. It has been described as primarily a stercoremia by one author,[1] as an infectious disease by another,[2] by others [3, 4, 5] as preparturient eclampsia, and more recently as uremic poisoning[6] and as an acidosis.[7] Whatever the principal immediate causative factor may be, there is no doubt in my mind that the

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predisposing cause is involved in the method of handling and feeding the pregnant ewe. This fact makes this condition of particular interest to veterinarians in the range states, as each year more sheep are being handled in small flocks under conditions which may be conducive to the development of this disease. We find that preparturient eclampsia is a disease of small flocks and does not occur to any extent in range bands.

In our experience the class of sheep in which this condition occurs consists of aged ewes, carrying more flesh than is usual for breeding sheep, and fed rather heavily, under conditions where they get little exercise. The individuals attacked in a flock are almost invariably carrying two or three lambs. In one case which we investigated the class of sheep involved was in general as described above, but the conditions were somewhat different from those found in the usual small farm flock. In this instance there was not the cumulative effect of heavy feed and lack of exercise, but the disease appeared immediately after a change of feeding conditions, made about thirty days before lambing.

The history in this case was that 420 ewes had been grazed until January 15 on wheat stubble and grass, covering enough range to give them sufficient exercise. These sheep kept unusually fat. They were due to commence lambing February 15, and about January 15 the owner started feeding alfalfa hay. He reported that, the day after he started feeding, several were sick and a few cases developed each day. After one day, when the sheep were fed hay twice and were not turned out at all, 30 new cases occurred. On January 29, when our investigation was made, 94 cases had occurred, with 25 deaths. All those that had died, except one, were carrying twin lambs.

The symptoms as observed by us are as described by others in published reports. The affected ewes at first show a stiff and unsteady gait. They stand with the nose held high. Spasmodic muscular contractions occur, followed by throwing back the head, staggering, sometimes in a circle, and falling. Following the spasms, the sheep lie on the ground in a semi-comatose state, breathing heavily. If placed on their feet, in some cases they walk off weakly, and in a few minutes the nervous symptoms reappear, the animal going into another spasm and falling. In some cases the sheep lie in a semi-comatose state for several days. They may eventually die, or they may gradually improve, especially if parturition occurs.

Examination of the urine, according to Dimock, Healy and Bullard,[7] shows that it is acid, and contains acetone, albumen, and an increased quantity of ammonia. These investigators also find evidence of acidosis by blood examination. It has been reported by Prior that the blood shows an increase in uric acid.

In some cases we find ewes dying without the symptoms of eclampsia, where the history shows heavy feeding and lack of exercise. These cases should probably not be classified with preparturient eclampsia as described above, although the predisposing causes are the same.

The lesions found on postmortem examination in our cases have been the same as those described by others. The only constant lesion found is the fatty liver. Some cases show congestion of the intestinal mucosa in places. We have not found intestinal obstruction to be a constant factor, sufficient to classify the condition as primarily a stercoremia. Histological examination of liver shows some chronic passive congestion, and fatty infiltration. The fatty infiltration is slightly more marked around the efferent vein. There is no degeneration of the nuclei of the liver cells, but some of the nuclei are flattened by pressure of the fat globules. It seems probable that the fatty liver may be a condition incident to the twin pregnancy and one of the factors that render the ewe susceptible to this type of auto-intoxication, rather than a lesion of the disease itself.

It seems reasonable to conclude that this condition in pregnant ewes is an auto-intoxication, manifested by the symptoms of eclampsia, and due to the combination of twin pregnancy with heavy feeding and lack of exercise, and in some cases a change of feed late in the period of gestation. In view of the fact that a condition of acidosis has been found to exist, a form of treatment which suggests itself is the administration of glucose. In this connection it is of interest to note that Dr. H. C. Gardiner, of Anaconda, Montana, who breeds about 4,000 purebred Hampshire ewes each year, states that he prevents the development of preparturient eclampsia by adding sugar-beet molasses to the drinking water of the ewes.

Stiff Lambs

Another group of more or less obscure diseases includes the lamb troubles in which the affected animals are called by the sheep men "stiff lambs." This term is applied to several different conditions, all of which produce in the lambs an abnormal gait, thus causing the owners to speak of stiff lambs.

Umbilical infection immediately after birth is responsible for many of the cases of stiff-lamb trouble which occur within the first three weeks of life. It is well known that umbilical infection may cause a septicemia or a necrobacillosis of the liver, either of which conditions will kill lambs from one to three weeks old. This form of infection may also produce an arthritis, as is the case with umbilical infections in other species. These losses may all be prevented by proper disinfection of the umbilical cord immediately after birth.

We find instances where there is no history of losses from umbilical infection during the first few weeks of life, but in lambs two or three months old an arthritis develops, which becomes chronic, not causing the death of the lambs but retarding their growth. We have found that this chronic arthritis developing later in life is also a result of umbilical infection at birth, and may also be prevented by navel disinfection.

In one band of sheep where a number of these chronic cases of arthritis appeared, we found the condition to be due to infection with a specific organism. In several cases that were studied bacteriologically the same organism was found in pure culture in the affected joints. This organism was a slender, Gram-positive bacillus which we have not yet definitely classified. It has some of the characteristics of the Corynebacterium group, of which *Bacillus pyogenes* is a member.

Dr. W. H. Lytle[8] describes a stiff-lamb trouble occurring in Oregon when the sheep are on the summer range. He states that during the summer about 20 lambs from a range band of 2,000 sheep may develop this condition, showing a stiffened and stilted gait, swollen joints, and loss of appetite. This is apparently a different condition from the infectious arthritis described above. The majority of the Oregon cases recover if the lambs are given good care and a sufficient supply of fresh water.

Another stiff-lamb condition the etiology of which is not understood is that in which we find the white muscle lesions described by Metzger and Hagan[9] in the *Cornell Veterinarian* for January, 1927. This disease has also been discussed briefly by Jungherr and Welch,[10] of the Montana Experiment Station. The white muscle disease is found in lambs in small farm flocks and not in range sheep. It occurs in flocks, where early shed-lambing is practiced, and not where sheep are lambed on grass. The symptoms appear when the lambs are three to eight weeks old, usually at the time when they are first turned out on grass. The

disease is characterized by a weakness of the muscles of the legs, particularly the hind legs. At first the lamb shows difficulty in rising to its feet, and moves with a slightly stiffened gait. The affected animal has difficulty in following the band. As the condition progresses, the muscular weakness increases. The lamb has great difficulty in rising to its feet, and when attempting to walk carries the leg forward in abduction. After a few days it may become unable to rise to its feet. There seems to be no systemic disturbance, as the lambs are bright and have a good appetite throughout. There is no evidence of arthritis. Most of the affected lambs become so helpless that they are killed by the owner. Some of the milder cases recover, but they are permanently stunted in growth.

The only lesions found are white streaks in the muscles, usually of the legs. The muscles of the trunk are occasionally affected, and in some cases the white areas are found in the heart muscle beneath the endocardium. The white streaks in the muscle represent degenerated fibers. The lesions are always found to occur in bilaterally symmetrical locations. For instance, if the flexor muscles of the left hind leg are involved, the corresponding muscles of the right leg will be involved to almost exactly the same extent.

The etiology of this disease has not been worked out. Bacteriological work and transmission experiments have shown that it is not an infectious condition. It seems probable that this condition is a deficiency disease. It occurs in small farm flocks that are lambed early, under more or less artificial conditions, and has been observed in Montana to occur most consistently in certain areas where the snow lies late in the spring. The Montana Experiment Station is planning experiments to be carried out during the next lambing season to determine if possible what the primary causative factor may be.

We have recently observed a clinical picture similar to that of the white muscle disease in lambs in which we find no gross lesions of any kind. This condition occurred in a small farm flock where lambing began about February 20. The owner reported that the lambs appeared to be perfectly healthy for the first three or four weeks. From that time on, all the lambs failed to do as well as they should, and cases of stiff lambs gradually developed. In these cases the early symptoms were of muscular fatigue appearing after exercise. The lambs walked normally for a short distance, and then developed difficulty in moving their legs. There

were muscular tremors, more pronounced in the hind legs, and soon the legs collapsed. After a rest the lambs rose to their feet and moved a little further. As the disease progressed it became more difficult to rise. At times after the lamb had struggled to its feet, the hind legs collapsed, and the lamb supported its weight on the fore legs and tried in vain to rise on the hind legs. After a number of days the affected lambs were unable to rise at all. As in the white muscle cases, there was no evidence of systemic disturbance in these lambs.

Progressive Pneumonia

There are several sheep diseases which are more or less peculiar to the range states, for which the etiology has not been completely worked out, and for which, therefore, we have not been able to recommend satisfactory control measures. Of these diseases, the most important is the chronic pneumonia, called "lunger" disease by the sheep man, and variously designated as progressive pneumonia, sand pneumonia, and fibrinous pneumonia by the veterinary profession.

As far as we are able to learn, the "lunger" disease is peculiar to the northwestern range states. We know of its occurrence in Montana, Wyoming, Idaho, Utah, Washington and Oregon, but it has not been reported as occurring in the southwestern states, nor in the eastern and central states. It is apparently a disease of range sheep, and has not been found to occur in farm-raised flocks in any part of the country.

This condition is a chronic, progressive, interstitial pneumonia, appearing principally in old ewes, although our investigations have shown that the disease is found in sheep of all ages and in rams and wethers as well as in ewes. The reason that it is popularly considered to be a disease of old ewes is that it is a slowly developing condition and the earlier stages in younger sheep are overlooked. An affected sheep that has reached the stage where the symptoms are noticed may live for six months or more, but most of the cases are dead within six months. As far as we know, no clinical case recovers.

In the earlier clinical stages of the disease the only symptoms are those caused by respiratory distress. The type of respiration is somewhat characteristic. The rate is accelerated. The inspiration is full and the expiration is forced, usually with a double effort, like that of emphysema in the horse. In the more acute cases the coughing may become quite severe, but in the majority

of cases the cough is not a marked symptom. As the disease progresses, the sheep become emaciated. Eventually, sometimes within two or three months of the time symptoms are first noticed, the affected sheep die in a cachectic state, probably from insufficient oxygenation of the blood.

On postmortem examination it is found that the lesions are confined to the thoracic cavity. In an advanced case, the lungs do not collapse when the chest cavity is opened. They stand up with full rounded borders. In some cases there are extensive pleural adhesions. The surface of the lung has a glistening appearance and gray color. There is little, if any, normal lung tissue in an advanced case. The whole lung has lost its normal bright pink color. The air-containing portions have little elasticity, due to interstitial thickening. Usually the apical and cardiac lobes are consolidated, as are portions of the diaphragmatic lobes, particularly along the basal border. On section, the consolidated areas have a red color, mottled with small gray nodular areas. A muco-purulent material may be found in the small bronchi. In some cases there are abscesses containing a smooth greenish pus. The only lesions found outside the lungs are in the mediastinal lymph-glands. These glands are enlarged, light colored, and have a fatty appearance on section.

Histological examination of material from these lungs shows a broncho-pneumonia, somewhat similar to the more acute pneumonia caused by lung-worm infestation. The primary pathological lesion which is found throughout the lung is a thickening of the alveolar walls due to infiltration with lymphocytes and macrophages. There is also peribronchial and perivascular infiltration with the same types of cells. In the consolidated areas the walls of the alveoli are thickened so much that the lumina are obliterated. In some places there is an exudate into the alveoli, and many bronchioles are plugged with leucocytes and epithelial cells. There is frequently proliferation of bronchial epithelium to such an extent that some areas resemble adenomas.

The etiology of progressive pneumonia has never been definitely worked out. We have for a number of years studied the bacteriology of this type of pneumonia and have found two organisms quite constantly present. These are *Pasteurella ovis* and *Bacillus pyogenes*. We have not been able to infect sheep experimentally with our cultures of the Pasteurella, although they are consistently virulent for guinea pigs. The diphtheroid, *B. pyogenes*, has not been definitely proved to have any causal relation to this disease,

but in a few experiments we were able, by repeated intratracheal inoculation of cultures, to produce small lesions in the lungs of sheep, of the same nature as the lesions found in lungers. In this connection it is of interest to note that we have found *B. pyogenes* to be the immediate cause of a fatal pneumonia in several outbreaks of verminious pneumonia in the wild mountain sheep. In these cases the organism was found in pure culture in the heart-blood, as well as in the lungs. The similarity of the type of pneumonia caused by worm infestation and that of the progressive pneumonia has raised the question as to whether the primary causative factor in these cases is not worm infestation in early life, but we have not been able to find evidence that this is the case.

From what evidence we now have, it is our opinion that the immediate cause of the fatal pneumonia is bacterial, but that the primary causative factor is respiratory irritation due to certain methods of handling sheep in the northwestern states. There is some resemblance between this type of pneumonia and pneumonoconiosis as recognized in man, which develops as a result of constant inhalation of dust of various kinds. We know that sheep are subject to irritation of the respiratory tract, as they are handled in the range country. Whenever they are moved in bands, their noses are in a dust cloud. When they are worked in dust corrals in the spring and fall, they are exposed to a great deal of dust. In many instances the respiratory tract is irritated by shedding the sheep in poorly ventilated sheds at lambing time. As the open range is taken up, it becomes more and more necessary to trail long distances to summer range, often in lanes where a cloud of dust is kicked up by the band. Another factor may be the feeding of dusty hay, particularly alfalfa.

The geographical distribution of the disease fits in with this theory. It has not been reported from the Southwest, and we find that in that part of the country winter feeding is not practiced to any extent. There is more open range, and the sheep are drifted from the mountain summer range to the desert for winter. The distribution seems to correspond to the area where winter feeding on alfalfa is practiced, where sheds are used in the lambing season, and where there are often long trails to summer range.

We have described this progressive pneumonia as peculiar to a certain section of the United States, but it is probably identical with a South African disease known as "jagziekte." Jagziekte is recognized as causing a considerable loss among the sheep of South

Africa, and has been studied for many years, but the etiology is still obscure. Sheep in that country are handled under somewhat similar conditions to those under which our range bands are handled. A comparative study of the pathology of these two diseases indicates that in our progressive pneumonia and jagziekte we are dealing with one condition found in two localities, and if it can be shown that the two are identical, we shall have made progress to the extent of simplifying our problems from an international standpoint.

Bighead

There occurs in Utah, southern Idaho, eastern Nevada, western and southern Wyoming, and southwestern Montana, a disease of sheep known as "bighead." This disease is characterized by a rapidly developing edematous swelling of the face, ears and throat, with an intense congestion of the parts of the head not covered with wool. The swelling is so great that the eyes may be closed. Serum exudes from the skin over the affected parts. The affected sheep become restless, toss the head, and show evidence of great irritation and itching. Affected sheep start to wander aimlessly and may leave the band. The swelling makes feeding impossible, and interferes with respiration. Fever is present, ranging from 104° to 107°F. Many of the badly affected animals die. The less severely affected sheep recover. In the recovered cases there is extensive loss of epithelium over affected parts.

This condition usually occurs in the spring when sheep are being trailed to shearing-pens or from winter to summer range. It has been noticed that it is most likely to occur following a spring snow storm, when the sun comes out bright and hot, and the sheep are driven in the hot sun.

The etiology of bighead has never been definitely established. European authors describe a similar disease of sheep and other animals as fagopyrism, in which the ingestion of buckwheat sensitizes the animal to the sunlight in such a way as to cause the development of the symptoms described when the sheep is exposed to bright sunlight after feeding on buckwheat. Moussu, in his book, "Diseases of Sheep," uses the name facial erysipelas, and states that the disease may occur where sheep have never eaten plants of the genus Polygonum, and may occur in black-faced as well as white-faced sheep. He describes the disease as a heliodermatitis, occurring in sheep which are sensitized to light

under influences which have not been determined. The limited geographical distribution of this disease in this country suggests the probability that in this particular section of the intermountain country there is a sensitizing factor, possibly a forage plant, which, under certain conditions, renders the sheep susceptible to a heliodermatitis.

Tick Paralysis

There is another disease of sheep which is of considerable interest, and whose pathogenesis is still obscure. This is the condition known as tick paralysis, which was discussed in detail by Dr. E. A. Bruce,[11] of British Columbia, at the 1925 meeting of this Association. Tick paralysis is known to occur in sheep in Montana and in British Columbia, where the tick involved is the wood tick, *Dermacentor andersoni*. In South Africa tick paralysis causes a very considerable loss in sheep, and the species of tick in that country is *Ixodes pilosus*.

Tick paralysis in sheep has been observed in Montana only in the southeastern part of the State. In the spring of 1923 and in the spring of 1925 this condition occurred in several bands of sheep in that section of the State. A report of these cases was made by Dr. A. F. Baldwin,[12] of Miles City, in *Veterinary Medicine* for November, 1925. These cases occurred late in March and early in April, when the wood ticks became active. About 10 per cent of the sheep in affected bands showed symptoms, and there was a loss of 1 per cent. The first cases were noticed about one week after the sheep became infested with ticks. The affected sheep first became restless, threw up their heads, started running, and fell down. Some were unable to rise again, while others staggered to their feet, but soon fell again. In the Montana cases death usually followed in a few hours, although some cases lived two days or more. On every sheep that died, engorged ticks were found. Where every engorged tick was removed, the sheep were able to stand in from one to twelve hours, and recovered completely.

In our laboratory we had opportunity to observe tick paralysis in a blue fox, which was evidently the same condition observed in sheep. The history of this case was that on April 23, 1927, the fox was weak and had difficulty in walking. On April 24, it could not stand. On April 25, the owner brought the fox to the laboratory. At this time the legs were completely paralyzed. The eyes were bright and the temperature normal. An engorged female

wood tick was found near the spine in the dorsal region, and later four more engorged ticks were found at different points on the body. The ticks were carefully removed, and within twenty-four hours of the time the first tick was removed, the fox was perfectly normal.

The etiology of tick paralysis is not known. According to Bruce, there is no evidence that the disease is the result of infection with an organism carried by the tick, and his theory is that the symptoms are due to a toxin secreted by the feeding tick. He is of the opinion that paralysis occurs only when the ticks are feeding more rapidly than usual, and that during this rapid feeding, more of the toxin is injected into the host than at the usual rate of feeding.

The Spotted Fever Laboratory at Hamilton, Montana, has found *Bacterium tularense* present in ticks taken from tick paralysis cases in sheep, and has also found in several cases that the blood serum of the affected sheep agglutinated *B. tularense.* These facts have raised the question as to whether tick paralysis in sheep, as observed in Montana, is not tularemia. This problem is being studied by Dr. R. R. Parker, of the Spotted Fever Laboratory. It seems improbable that tick paralysis and tularemia can be identical, in view of the fact that complete recovery from tick paralysis occurs after the removal of the engorging female ticks.

REFERENCES

[1]Bruce, E. A.: Stercorema of sheep. Jour. A. V. M. A., lv (1919), n. s. 8 (5), pp. 553-557.
[2]Newsom, I. E.: Am. Jour. Vet. Med., xiii (1918), 7, p. 353.
[3]Luckey, D. F.: Good care kills sheep. Am. Jour. Vet. Med., xiii (1918), 5, p. 248.
[4]Frey, F. F.: Antepartum paralysis in sheep. Am. Jour. Vet. Med., xiii (1918), 6, p. 283.
[5]Hadley, F. B.: Preparturient eclampsia of ewes. Am. Jour. Vet. Med., xiii (1918), 6, p. 284.
[6]Prior, Robert: 7th Biennial Rpt. of Dept. of Agr. of Wash. (1926), p. 77.
[7]Dimock, W. W., Healy, Daniel and Bullard, J. F.: Acidosis of pregnant ewes: so-called pregnancy disease of sheep. Jour. A. V. M. A., lxxii (1928), n. s. 25 (4), pp. 511-516.
[8]Lytle, W. H.: 1928 Oregon Sheep and Goat Owners' Directory and Use Book, p. 106.
[9]Metzger, H. J. and Hagan, W. A.: The so-called stiff lanbs. Corn. Vet., xvii (1927), l, p. 35-44.
[10]Jungherr, E. and Welch, H.: A report on lamb diseases. Jour. A. V. M. A., lxxii (1927), n. s. 25 (3), pp. 317-326.
[11]Bruce, E. A.: Tick paralysis. Jour. A. V. M. A., lxviii (1925), n. s. 21 (1), pp. 147-161.
[12]Baldwin, A. F.: Vet. Med., xx (1925), p. 507.

DISCUSSION

DR. H. L. FOUST: I saw a flock of about two thousand animals confined in a wide area being fed on wild oats. The losses were very great, six weeks after feeding. I wonder if Dr. Marsh has had similar experience.

DR. MARSH: We had lamb losses in similar instances, apparently due to heavy feeding. I have seen it in Billings, where they were feeding corn, alfalfa and beet pulp. The lambs died quite similarly to this pregnancy disease in ewes.

DR. W. A. HAGAN: In New York State we have heard a great deal of so-called "stiff-lambs." We are quite convinced it must be connected with the feeding. Usually the ewes are rather heavily fed. Last spring we found one flock of ewes that the owners had bought ready to lamb. Only about one-half of the flock had been purchased and this half had this disease. We went over to the place where the other half of the flock was kept and these ewes did not

have the trouble. We also have seen the trouble in only one lamb of pairs of twins. We found it interesting to trace down the second twin. The lesions of the disease were found in the second twin which, although appearing normal, nevertheless was diseased.

Dr. Marsh spoke of "lunger" disease. I have not seen it in the East, but we do have a condition in calves which is apparently similar, called calf pneumonia.

DR. SEYMOUR HADWEN: I have enjoyed this paper very much. I have not worked with ticks for many years, but some very good work has just been done in Australia where they have come to the same conclusion. This disease is due to some toxic material. I have noticed those ticks dig in fairly deeply. They inject this material below the skin. That is possibly the answer. I think it is the toxic material which is injected and the lambs I saw all showed signs of it.

DR. F. M. NELSON: I have been with Dr. Welch some and have seen some lambs, north of Livingston, Montana, suffering with this muscle lesion disease and, at the suggestion of Dr. Butler, our state veterinarian, we fed yeast to some of the bunch and the lambs recovering acted like pacing horses. Mr. Holliday, the owner, said he lost only two of the sheep after giving them yeast and cod-liver oil.

A Hopeful Sign

It has been stated by those who are in a position to know that many successful veterinarians now spend 80 to 90 per cent of their time in handling business in connection with the treatment of meat animals and small animals instead of with horses. This means that the veterinarian of the present day must have a different type of education and training than did his predecessor. It is interesting to note that at a recent short course for veterinarians held at Purdue University, 60 men engaged in practice in Indiana attended, to learn more about their profession. It is a hopeful sign to see this apparent desire on the part of the men who are in position to prevent live-stock and animal diseases, to get information that will aid them in promoting the industry they are endeavoring to serve. The day of the quack "hoss" doctor is gone and in his stead has come the progressive, wide-awake veterinarian trained in the profession that he practices.

—*Rochester (Ind.) News-Sentinel.*

Horse Breeder Addresses Veterinarians

At the regular monthly meeting of the Cedar County (Iowa) Veterinary Association, at Cedar Rapids, February 22, 1929, Mr. Fred Holbert, of Greeley, Iowa, was the principal speaker. Forty veterinarians and guests were in attendance.

Mr. Holbert, who is a member of the horse-importing firm bearing his name, related his experiences in Belgium and France, while he was buying horses for importation to his stables at Greeley. He made the very interesting observation that Iowa has been importing more horses than she has been exporting during recent years.

CANINE DISTEMPER*

By F. W. Wood, *Berkeley, Calif.*

A review of the literature on canine distemper makes it evident that a considerable difference of opinion exists regarding the etiology of this disease among authorities on this subject. The statement seems true with reference to the symptomatology and anatomical changes described as being characteristic of this disease. Practically all writers describing distemper in dogs, however, consider this disease as being the most serious and widespread of the infectious diseases which affect the canine family.

Distemper is an acute infectious disease affecting the canine race. Ferrets also are susceptible. It is characterized by an initial rise of temperature, dullness, loss of appetite and rapid loss of condition. Later in the course of the disease congestion and a catarrhal inflammation of the conjunctival and respiratory mucosae are often seen. At this time, in the more acute cases, nervous symptoms may appear, varying in intensity from slight involuntary twitchings in certain groups of muscles to epileptiform-like convulsions. A varioloid-like skin eruption also may be seen in infected dogs.

Distemper of the canine family, according to Carré,[1] is caused by a filtrable virus. This virus is contained in the body fluids of infected dogs and is most infectious during the initial febrile period of the disease. Susceptible dogs are readily infected by the injections of small amounts of the virus and animals so inoculated, following a somewhat variable incubation period of from three or four to eight or ten days, develop distemper. Laidlaw and Dunkin, as a result of their research work,[2,3] support the views of Carré, offering the following conclusions regarding the etiology of distemper.

(1) Dog distemper can be transmitted from dog to dog, from ferret to ferret, or from ferret to dog by material in which no bacteria can be demonstrated and which yields no growth of organisms in ordinary culture media.

(2) The infecting agent can be passed through bacterial filters of standard type and proven quality.

(3) The infecting agent cannot be cultivated in any straightforward manner so far employed.

From these three conclusions it follows that the infecting agent of dog distemper belongs to the class of filter-passing viruses.

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Following Carre's findings, Ferry,[4] Torrey[5] and M'Gowan,[6] working independently, reported that they had isolated a small Gram-negative organism from dogs affected with distemper and were able to reproduce distemper in susceptible dogs through the injection of cultures of this organism which is now known as the *B. bronchisepticus*. The contradictory findings of these investigations had lead to considerable confusion as to the etiology of distemper in dogs, and has undoubtedly resulted in the grouping of at least two distinct diseases of dogs under the name of canine distemper. It would seem that while Ferry, Torrey and M'Gowan have undoubtedly good grounds for their claims as to the pathogenicity of the organism they have isolated and described, these investigators were not working with true filtrable-virus canine distemper but with an entirely separate disease for which we have no distinctive name at present, and a disease which very often complicates or follows an attack of true canine distemper The condition described by Ferry and Torrey is in all probability really an infectious pneumonia of dogs and not true distemper.

The incubation period of experimental distemper in dogs is from four to seven or eight days. In ferrets the incubation period is of longer duration, being from nine to twelve days. The first symptom shown in distemper is an elevation of temperature of from one to three degrees (103° to 106° F.). This initial rise of temperature is usually accompanied by a watery discharge from nose and eyes with more or less conjunctivitis. The initial temperature is usually maintained for two or three days, when it may fall to nearly normal. A second rise in the temperature, which is usually maintained for some time, may occur three or four days after the initial rise and it is during this second febrile period (eighth to tenth day after infection) that one sees the usual symptoms associated by the practitioner with distemper (loss of appetite, wasting, diarrhea and cough).

The anatomical changes found in dogs suffering from uncomplicated or filtrable-virus distemper during the early stages of the disease are not marked. There may be a congestion or catarrhal inflammation of the respiratory and conjunctival mucosae. The lymphatic glands are somewhat edematous and swollen and there may be an increase in the serous fluids in the body cavities. Small hemorrahgic areas are often found on the lungs and urinary bladder. More rarely these hemorrhagic areas can be demonstrated in the kidneys and lymphatic glands. From what has been said it will be seen that uncomplicated cases of true filtrable-

virus distemper do not show any marked lesions. Laidlaw and Dunkin state that pneumonia is very rare in experimental distemper. In dogs affected with the disease described by Ferry and Torrey as distemper we have a broncho-pneumonia with the usual changes associated with this condition. As has been said, this type of broncho-pneumonia often follows an attack of true canine distemper. Again, following distemper, infections of the intestinal tract not infrequently occur.

In true distemper the nervous symptoms so often described consist of spasmodic contraction of certain groups of muscles often first observed in the muscles controlling the lips, nose and mastication, but may involve the whole body, resulting in periodical epileptiform-like fits. Laidlaw and Dunkin state that nervous symptoms were noted in 10 per cent of their experimental cases and denote a severe type of the disease. It is not known at the present time whether the chorea-like affections which, in some outbreaks of distemper, follow apparent recovery are a result of the filtrable-virus disease or from some infection following the primary attack of distemper.

Experimentally it can be shown that distemper may be transmitted to susceptible dogs by the injection of tissue fluids obtained from infected dogs and that dogs hyperimmunized against canine distemper by means of massive doses of virus will yield a serum which will, when injected into susceptible dogs, modify or prevent for limited periods infection with distemper either through contact or inoculation. Also it may be shown that susceptible dogs injected simultaneously with serum obtained from immunized dogs together with a small amount of virus obtained from infected dogs will, after a period of three weeks, be found actively immune against infection with canine distemper. It is true also that dogs immune to canine distemper are still susceptible to *B. bronchisepticus* infection, as described by Ferry, Torrey and M'Gowan. Injections of serum obtained from distemper-immunized dogs do not prevent or modify the type of pneumonia which results from infection with *B. bronchisepticus*. These facts would tend to indicate that canine distemper is a specific infectious disease caused by a filtrable virus and that at least two diseases of dogs are commonly classed as canine distemper and it may be that we are also including other specific infections of dogs under the general heading of canine distemper.

Treatment of canine distemper cases, from the practitioner's standpoint at least, is usually symptomatic, since most of the

cases when presented for treatment have passed through the initial febrile stage of the disease and are suffering from malnutrition, pneumonia or other complications. Good nursing, proper feeding and housing are essential in the treatment of these cases. Seemingly mild cases and prompt recoveries should not lead to over-confidence and prognosis should always be guarded. Medicinal agents administered should be for the purpose of maintaining the tone and strength of the patient and antipyretics, if employed, should be used with caution. Biological products have a place in the prevention and treatment of distemper. Among these products is an homologous anti-canine distemper serum, a specific anti-serum prepared from the blood of dogs which have been hyperimmunized against the filtrable virus of canine distemper. This serum, administered in doses of from 10 to 30 cc to dogs, in the early stages of distemper, often aborts the disease and brings about a prompt recovery. In some patients improvement may be followed by a relapse on the second or third day of treatment, and in these cases the serum treatment should be repeated. A single dose of from 10 to 20 cc of serum will confer a passive immunity against distemper for a period of from 10 to 20 days. This period of passive immunity may be made use of to protect show animals; dogs left at boarding kennels; those intended for shipment; or other conditions where non-immune dogs may be subjected to possible exposure and infection for short periods.

Homologous anti-canine distemper serum is also of benefit in the treatment of distemper complications; but as might be expected in these cases results are not striking, nor as good as when it is used in the early stages of the disease, because the complications encountered in distemper are due to secondary infections and not to the primary filtrable virus infection.

Summarizing our knowledge on distemper in dogs it would seem fair to assume that (1) this disease is a specific infection caused by a filtrable virus. (2) That the immunity conferred by an attack of distemper is complete and usually permanent. (3) That there is a tendency toward grouping more than one disease of dogs under the heading of distemper, a practice which should be discouraged, since it may lead to troublesome confusion which may take years of educational and investigational work to overcome.

REFERENCES

[1]Hutyra, F. & Marek, J.: Pathology and Therapeutics of the Diseases of Domestic Animals. (3rd ed. Alexander Eger, Chicago, 1926), i, p. 254.

[2]Laidlaw, P. P. & Dunkin, G. W.: Studies in dog-distemper. I. Dog-distemper in the ferret. II. Experimental distemper in the dog. III. The nature of the virus. Jour. Comp. Path. & Therap., xxxix (1926), pp. 201-230.

[3]Laidlaw, P. P. & Dunkin, G. W.: Studies in dog-distemper. IV. The immunization of ferrets against dog distemper. Vet. Rec., viii (1928), 22, pp. 433-435.

[4]Ferry, N. S.: Etiology of canine distemper. Jour. Inf. Dis., viii (1911), pp. 399-420.

[5]Torrey, J. C. & Rahe, A. H.: Studies in canine distemper. Jour. Med. Res., xxvii (1912), pp. 291-364.

[6]M'Gowan, J. P.: Some observations on a laboratory epidemic, principally among dogs and cats, in which the animals affected presented the symptoms of the disease called "distemper." Jour. Path. & Bact., xv (1911), pp. 372-426.

DISCUSSION

DR. S. W. HAIGLER: Did I understand Dr. Wood to say that the chorea symptoms were rare in distemper?

DR. WOOD: Yes, comparatively rare.

DR. HAIGLER: Does the immunity produced by serums protect the dogs against secondary infections?

DR. WOOD: No. Injections of serum will protect only against the virus infection.

DR. H. MEADE HAMILTON: Have you been able to figure out the cause of the nervous complications accompanying distemper?

DR. WOOD: I don't know whether you understood me correctly in speaking of the nervous form. We have so-called nervous symptoms in distemper which we see in a considerable number of cases, but if you are speaking of the chorea-like affection which is often considered as a complication of distemper, I do not think this condition is due to virus infection.

DR. HAMILTON: You did not get my question. I refer to convulsions.

DR. WOOD: Convulsions are a symptom of distemper and are at times associated with the virus infection.

DR. J. E. CRAWFORD: What percentage, in your opinion, of those treated with the serum, have come down with distemper when exposed, say three months afterwards? What procedure would you take with a four-months-old puppy, not exposed, to permanently immunize it from distemper the first year of life?

DR. WOOD: I would be very pleased if I could answer your questions. I don't think that any statistics which can be safely quoted in percentages are available on this subject. Immunization against distemper is experimental. Laidlaw and Dunkin seem to have shown that 90 per cent, or better, of ferrets can be immunized. As far as dogs go, I don't know where one can get exact information, but I will say that one can immunize dogs very satisfactorily. As to how long the immunity will last is still an open question. We would infer that in most instances immunity will last quite a long time.

DR. CRAWFORD: Would you advise a second immunization three months later, another at seven months and still another at ten months?

DR. WOOD: Such a procedure would do no harm and is added protection, but I think ordinarily unnecessary.

DR. J. A. ALLEN: May I ask Dr. Wood if he has any means of standardizing this new product? Do you know if each batch of the product is of equal value? Are there any means of having a uniform product?

DR. WOOD: I might say that here we are dealing with a filtrable virus. Beyond testing for disease-producing and antigenic properties, one cannot satisfactorily test the antigen. In other words, conditions are the same as with smallpox vaccine or any other product in which a virus is used as an inoculating or immunizing agent.

DR. ALLEN: What means of attenuation have you, or is that a secret?

DR. WOOD: No, there is no secret about it. I suppose you are speaking of distemper antigen. The agent put out for immunizing purposes against distemper is spoken of an an antigen" and not as a virus." Possibly the point you had reference to in your question was as to the preservative employed. One ean use phenol or formaldehyde satisfactorily, and I believe chloroform may be just as good. I am trying some experiments now with chloroform.

DR. J. C. FLYNN: Take as an example a German shepherd, three months of age—dropped him and broke his leg—rather a valuable dog, and used to being in the hospital two or three weeks. We are advised that four months is the proper age to immunize a puppy. What are we going to tell this client? We feel we can take that puppy into our hospital two or three weeks without immunization, that he stands a good chance of becoming exposed, and about the time the injury is healed he is ready to come down with distemper. The way I have been handling the situation is this: I advise them it is almost impossible to take a young animal into the hospital without exposing it to distemper. No matter where the owner has that animal, I advise him to immunize that dog at this time, and then again in sixty to ninety days to reimmunize, and I get along very well with that, providing I can sell him the idea. Now then, the financial part comes in and plays quite a large part. You are asking him for a fee for reducing the fracture. You have got to sell the idea to him to immunize twice, or else you are going to have him take the chance which is nearly always fatal, the idea of your losing the customer and the customer losing his dog.

Speaking of permanent immunity, I don't believe the investigations have gone far enough for anybody to know whether or not there is such a thing as permanent immunity, because the investigations so far have not extended over a sufficient period of time for us to know whether it will hold for the life of the dog or not. I don't know the average life of the dog, but I would say it would possibly run around seven or eight years. When a dog has reached the age of six months, his expectancy possibly would be about eight years, and I don't believe the investigations have covered a period of that length so that a definite statement can be made.

DR. WOOD: I believe Dr. Flynn's remarks are quite in order with the known facts. If you are receiving a dog you believe to be susceptible, into the hospital for treatment, the logical thing to do is to depend upon serum for immunity until the animal recovers from the injury. The period of immunity from serum is quite short—ten to twenty days. As regards the duration of immunity from the antigen, we know very little at the present time. Dogs over two years old are usually immune to distemper. Immunity following recovery from a natural attack is, I believe, as permanent and complete as one gets following smallpox or measles. As to the duration of immunity you may expect from the antigen immunization, this question will have to be answered some time in the future. The immunization of dogs against distemper is too new yet to give a definite answer.

DR. CRAWFORD: In reference to Dr. Flynn's question, we have found, after considerable experimenting with this serum, that when the pup comes in to remain in the hospital a few days or a week, we do not give him the virus, we give him the serum, and it has worked our very successfully. As I stated in my paper, we give it with or without the consent of the owner. It costs about $1.50, and I will risk $1.50 on that puppy. If he remains there ten days he gets a second one, and you will get more than $3.00 worth of profits. We did use the serum and the antigen on dogs remaining four or five days, and we found that it does lower the resistance and they will come down with distemper very often. But with the serum alone, I believe you can keep a puppy immunized for any length of time almost.

DR. H. K. MILLER: Our experience has been similar. We have been using the serum on our own account where the owners did not feel they would like to pay for it. As regards permanent immunity, we have been going slow, and in every case I have always told them that I did not know how long the immunity would last. Practically all of the practitioners have a number of well-developed cases of distemper, probably six to ten months, showing there is no permanent immunity. Especially in outside cases I believe that distemper comes at anywhere from six to twenty months old, especially when dogs begin to travel around. That is the time you want to look out for—when they begin to go out visiting, at ten or twelve months of age—that's when they come down with it.

DR. C. S. CHASE: I should like to ask the essayist if, in his opinion, he does not consider a serum which is produced within the body of a horse equally

efficacious as that produced within the body of a dog. We know that in many instances of plain straight distemper, if we give them a good large dose of plain horse serum, after they have been exposed, you will get almost the same result as from specific biological products. Is it not equally efficacious to use a less expensive one, which is not produced within the body of the dog? We do know we get wonderful results from plain horse serum.

DR. WOOD: Perhaps I do not know exactly what you mean by plain horse serum, but the only effect one could expect from normal serum would be the same as one gets from the injection of a foreign protein. You are dealing here with non-specific therapy, and it is a phase of treatment I am not well up on. As to the hyperimmunization of a horse against canine distemper virus, I do not think it can be done. We have not been successful in the production of anti-sera against filtrable virus infections except through the use of serum-producing animals which are susceptible to the virus itself.

DR. CHASE: Most of our very serious cases are the result of complications with pathogenic organisms that are not the cause of distemper, but are the sequelae of distemper. Now, if we give a vaccine, in minute doses and gradually increase these doses according to the tolerance of the animal, will we not get just as good results? I cannot say that I have had any better results with dog serum than with ordinary horse serum.

DR. WOOD: In the treatment of complications associated with distemper, you are not treating canine distemper. It would be more advantageous to use a mixed infection serum than any other product in the treatment of complications, and it is my belief that you will have much better results in the treatment of pneumonia or the ordinary complications of distemper if a mixed infection serum is used.

DR. C. F. SCHLOTTHAUER: I don't see why it would not be advisable to inject serum only, the first time. I recommend double treatment of dogs. We have no way of telling that they have not been exposed to distemper before coming to the hospital. I never take a chance on the serum the first time. The dog might be just a day after a fever.

DR. H. C. SMITH: I understood Dr. Wood to say that the antigen is a true antigen. Why then is it necessary to give the serum with it?

DR. WOOD: I thought I spoke of that. The immunizing agent is spoken of as an antigen, not as a virus. It is produced from material which contains the virus, but the virus is modified. In other words, with a true virus one would expect to reproduce the particular disease uniformly by injecting the virus. The antigen will not regularly reproduce canine distemper, though it will produce an immunity response. The antigen, in other words, is a modified virus.

DR. SMITH: If that is the case, it would not be necessary to give the serum, would it?

DR. WOOD: I think it is advisable to give the serum when administering antigen.

DR. CRAWFORD: I would like to say that in our practice the past year, when the puppies would be acting a little strange, and the clients would get into the notion of having them vaccinated, I would explain to the clients that those puppies may be infected with distemper now, and I would advise giving the puppies a very large dose of serum and then have them returned to the hospital to be permanently immunized. In my experience this has proved successful. I would not say 100 per cent, but probably 50 to 60 per cent successful.

HIS TROUBLE

The actress' pet dog had died.

"Now I'll have to have him stuffed," she sobbed to the veterinarian.

"That's unnecessary, madam," the doctor replied. "He's been stuffed enough—that's why he died."

THE HOSPITALIZATION OF SMALL ANIMALS*

By J. ELLIOTT CRAWFORD, *Far Rockaway, N. Y.*

I wish to express my appreciation for being allowed the privilege of addressing this section of the Association upon the important subject of "The Hospitalization of Small Animals."

Up to within comparatively recent times, the practice of veterinary medicine was confined principally to the larger animals, the horse receiving major attention, but with the general increase of automobiles for pleasure and business, all this has been changed, more especially in the cities and suburban centres, and we find today a great number of veterinarians who are specializing in small-animal practice.

An important reason for this change is that the people are becoming more attached to dogs and cats that are kept simply for pleasure and pride of ownership, as evidenced by the increase in the number of dog shows and the increasing patronage they receive. It is gratifying to note that the interest in small animals is extending to the smaller towns and even the rural communities.

This type of practice is remunerative and the veterinarian who will equip himself thoroughly and specialize in the treatment of small animals will be well repaid financially and also in the esteem and respect of his clients. The men and women who love their pets will respect your ability in proportion to the care and comfort you give their dogs and cats when they are ill.

Primarily our business is that of treating sick animals—to cure them of their ills in the shortest possible time. To do so we must exercise every possible means at our disposal. Thus we find it is not merely a matter of diagnosis, but it includes hospital care if the case is left in our charge.

HYGIENIC CONTROL, DIET, ETC.

Certain equipment is essential in a small-animal practice. I believe that to conduct such a practice successfully a hospital is a necessity. I am satisfied that a small-animal hospital, properly constructed, equipped and conducted in a proper manner, will be well patronized and appreciated by the community we serve. On the other hand, a poorly constructed building, with poor light and ventilation and dark dens for kennels, where dogs and cats are placed in some localities today, is perhaps the chief

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reason why the public hesitate to send their pets to an institution to be cared for.

It has been a hobby of mine for a number of years to make a point of visiting the veterinary hospitals in any town I happen to be visiting, and I am glad to note that small animal hospital construction has undergone considerable change for the better in the past few years, and the public are being educated to the fact that it is possible to send their animals to an institution for treatment without the danger of having them infected with prevalent diseases.

In selecting a location for a hospital, secure as prominent a site as finances and the zoning law will allow. See that you are not too close to any residences or you may have trouble later. I believe a one-story building is more practical for a small-animal hospital. I do not consider wards on the second floor as practical for obvious reasons, unless you are limited for building space.

In the construction, sanitation should be given careful consideration when the building is planned. If not, it will be difficult to bring it about after the building is completed. It is important to have a pleasing exterior and careful consideration should be given to every detail.

The building should consist of reception-room, office, examination-room, operating-room, kitchen, store and drug-room, wash-room and wards for the patients, one for each particular type of cases. This is more convenient and easier to keep in a sanitary condition. The animals can be kept under better control than where the general hospital is in an open space. I should say about ten or twelve dogs to a ward is about the proper number to house together. All windows and openings into the hospital proper should be thoroughly screened as a means for the elimination of flies. The outside exercising-runs should be well fenced to prevent the escape of any of the patients.

A good heating plant should be installed and a plentiful supply of hot water at all times should be available in the examination-room, operating-room, wash-room, kitchen and wards. This makes it possible to keep everything spotless, especially since we talk so much about cleanliness.

The hospital need not be large, but large enough to prevent overcrowding. I believe that from a sanitary standpoint a hospital should not be over two-thirds full, except during occasional rush seasons. The building should be so constructed that additional wards can be added without detracting from the

architectural lines of the building. A clean, well-appointed office and waiting-room, similar to that used by physicians and dentists, should be provided, with neat, well-appointed furniture.

We should endeavor to impress our clients so that they will be willing to leave their pets to our tender care. I believe that an examination-room is an absolute necessity, for if we use our operating-room as an examination-room, we will find that eventually infectious diseases are contaminating everything we use. The examination-room should be provided with a strong, substantial table, easily sterilized for the examination of patients, with a cabinet for drugs. In our institution we use an extra-heavy, glass-topped table and find it very satisfactory and practical. In the examination-room, order, system and knowledge of our business should impress our clients.

The operating-room should be well-lighted, have a southern exposure, if possible, have a sanitary floor of tile or other waterproof material, with floor-drain, be provided with operating-table, instrument cabinet and sterilizer. If financial considerations will permit, a tile floor throughout the entire building will be a good investment for utility and service. It is easily kept clean, looks well and is permanent. The construction of the kennels for the wards should be carefully considered. They can be constructed of all wood, steel, slate, opal glass and steel. All of them have good and bad features.

In our institution we use a wood kennel, lined with galvanized iron, with soldered tight bottoms painted and enameled white with iron grill doors. This makes a good sanitary kennel which is easily cleaned and wears and looks well. However, it should be borne in mind that they need not be expensive, as long as they are clean and comfortable. They should be roomy. I find that a kennel 3½ feet by 4 feet makes a comfortable house for a large or small dog. For bedding we find that newspapers are a very convenient bedding, cheap, clean and appealing to our clients.

The wards should be well lighted. Sunlight is a cardinal requirement, if at all possible, for its effects on the patients and for our own convenience. A well-lighted room, with tile floor and drain should be provided, with bath-tub where dogs can be bathed and where clipping and trimming can be carried on without soiling the wards or other rooms.

A kitchen will be found very convenient for the preparation of foods, the washing and sterilization of feeding utensils and the storage of supplies, etc. A refrigerator should be installed for

the proper keeping of biological products. A comfortable room and bath-room will have to be provided for the use of the attendant. This should be kept in a neat, orderly manner, in keeping with the rest of the establishment.

A separate ward should be maintained for skin diseases at the rear of the building, with a separate yard for their use, for if kept with the other patients they will soil the wards and give off an offensive odor which is disagreeable at times. In an institution of much pretensions a distemper ward is an absolute necessity, as there are times when one-quarter of your patients will be distemper cases.

The distemper ward should be separated from the hospital proper, if possible, and have a separate entrance. The attendant in charge should not be allowed in the general wards and those in the other wards should not be allowed in the distemper ward. It should be spacious, with walls and floors constructed of tile or other material which is sanitary and easily cleaned, with proper drainage and sewer connections in the floor. It should be well-lighted and heated and have a plentiful supply of hot water. Naturally any ward in which distemper dogs are kept is bound to give off an offensive odor, but with proper ventilation, sunlight and plenty of hot water, soap and disinfectants, this can be controlled.

An outside run will be necessary for the distemper convalescent cases. This should have a cement floor and drain so that it can be washed and disinfected daily. As distemper patients usually remain longer in the hospital then the other patients, visitors will be coming in frequently to inquire, and in most cases will insist upon seeing the patients. We should endeavor to make this ward attractive and comfortable and be at all times ready for the inspection of visitors.

I have observed that when folks visit their physician or dentist they usually go alone, but when they visit a veterinary hospital they usually come in pairs. Often the whole family and friends come to visit the canine or feline patient. They love to look around and ask questions and see the animals. They should be received with every possible courtesy and attention. I have found that it is excellent publicity to take pains to receive and conduct visitors around the institution, because when they or their friends are in need of veterinary service, they will remember the institution. By such methods we acquire the confidence of the pet animal owner, and he takes a pride in the institution

where he leaves his pride and joy to our tender mercy to be cared for.

All walls and ceilings in all rooms, except office and waiting-room, should be finished in white enamel. This makes for cleanliness, is cheerful looking and increases the lighting effect. Once a year one coat of a gloss white paint will usually be sufficient if a good job was done when the building was constructed. There are seasons when business is slow and the attendants can turn in and repaint. This makes everything look new.

The kennels should be cleaned early in the morning, before clients begin to arrive at the office. A general inspection of all patients should be made as early in the morning as possible, noting the condition of each animal, so that you can be ready for inquiries by phone, which usually start early in the morning, as to the condition of the various patients. Patients should be examined in a gentle but firm manner and subjected to a thorough inspection. A correct diagnosis is necessary in order to prescribe rational treatment.

We realize that the practice of medicine is not an exact science. Each individual case is subject to general principles and requires the application of knowledge, sound judgment and the exercise of patience and skill. Inevitably even the most careful and learned practitioners will make errors. In examining obscure cases, a microscopic examination for parisite eggs in the feces should not be overlooked as an aid in diagnosis, and in diagnosing skin diseases, a scraping of the skin should be examined under the microscope before a definite diagnosis is given. When the patient has been thoroughly examined and prescribed for, it should be returned to the owner, or, if a hospital case, a proper record made and turned into the ward.

Collars, leashes, harness, etc., should be carefully checked. In case the client is a stranger, financial arrangement should be made when the patient is received and substantial retainer demanded to insure the return of the owner. I believe it is a sound policy to collect hospital fees weekly in advance, unless we are sure of the financial responsibility of the owner to pay the account when rendered.

There are three great points which make for success in the management of a small-animal hospital:

First: Keep records.
Second: Keep books.

Third: Collect cash in advance or when animals are discharged, and mail bills promptly.

If we do these things and do them religiously we cannot help going forward professionally and financially. When a client offers to pay cash, never say, "I will send you a bill." The time to strike is when the iron is hot. When you send bills, mail them on the last day of the month, not on the fourth or fifth. Usually with the debtor it is first come, first served, and you are likely to be at the top of the list if your bill gets in among the first ones.

Another point I wish to stress: Never let an animal leave your institution in a dirty, insanitary condition. See that they are properly bathed, combed and free from disagreeable odors. Your clients will appreciate this and it will bring good results.

When young dogs are to remain in the hospital for any length of time, we have found it good practice to give them a dose of anti-distemper serum, from 10 to 30 cc, according to the size of the dog. We do this with the consent of the owners or if we have not the consent we give it to them anyhow.

Feeding

The trite saying that a dog lives on a third of what he eats and the veterinarian lives on the other two-thirds is founded more on fact that fiction. The feeding of dogs and cats in hospitals is very important in combating and avoiding disease. I believe we all realize that a large proportion of the disturbances in the digestive tract of our patients are traceable to faulty feeding and a great proportion of cures can be brought about by the adoption of proper dietetics. I am convinced that a great many of the sporadic cases of "fright fits" can be traced to the digestive tract. Likewise, a large portion of our eczema cases and other skin conditions are brought about by improper diet. A large number of digestive troubles in our patients need only restricting the diet for several days to effect a cure, while in animals recuperating from debilitating diseases, nourishing and concentrated foods are required.

In the feeding of animals in the hospital, regularity is important. A regular time each day should be set apart for feeding. Dogs are apt to be noisy at feeding time, especially any that have been in the hospital for some time.

In the preparation of the general diet we boil the meat (beef and lamb stew) in a large covered vessel, with water to cover, and salt enough to season. To each four pounds of meat we add a pound of onions. Boil until the meat is easily broken up and pour

over broken biscuits while boiling. Allow to stand until cool enough to feed. The mixture should not be sloppy but moist enough to soften the biscuits. We find that a mixture of one-third meat and two-thirds biscuits, with the added vegetables, makes a good diet for the general run of hospital cases. In selecting vegetables, I have found that onions make an ideal vegetable for dogs when boiled and incorporated with the meat. Other vegetables, such as carrots, spinach, peas, beans and lettuce also can be used. I believe that this diet should be changed at least once or twice a week, with a meal of raw lean beef as a change, in order to keep the dogs in good physical condition.

When dogs remain in the hospital for any length of time, a large raw beef bone should be given every few days. This will keep the teeth in condition and also aid the digestion.

Diet for the cat should consist of boiled fish and milk. Occasionally canned salmon and boiled liver can be given for a change. The patients on a special diet, such as puppies, kittens, distemper cases, dogs with digestive disturbances and those that cannot be considered on a general diet, should have special attention.

Puppies should be fed three times a day, giving them meat broth, milk, raw lean chopped beef, buttermilk, eggs with milk, etc. Convalescent patients, with digestive disorders, and distemper cases will require special diets, including beef juice and extract, milk and eggs, buttermilk, raw lean beef, finely chopped, and meat broths.

Milk is a very valuable food, especially in young animals. It is a perfectly balanced food stuff; it is rich in calcium and phosphorus and the three principal vitamins. I consider it indispensable as a food for young and sick dogs, either alone or with eggs. There are a number of canned foods on the market, most of them having meat for a basis. They can be used occasionally in an emergency or as a special diet.

The personal appearance and dress of the attendants is important. I know of nothing that has a better effect on clients who visit the institution than to see the attendants dressed in clean gowns. The cost of laundering is small in comparison with the effect it will have on the public. I have visited hospitals and have received a very unfavorable impression from the sloppy appearance and dress of the attendants.

The fees charged for the care and treatment in the hospitalization of small animals should be in proportion to the cost of

operating institutions such as the small-animal owners desire and the service you render.

In conclusion I wish to state that I am satisfied that our clients are going to advertise us favorably or unfavorably, depending upon our personality and the character of the service we render them. We must be judged largely on the basis of general results, because our clients have no technical standards by which to judge us.

I wish to emphasize the necessity of encouraging members of our profession to develop their general qualifications so that the impression which they make will not only enhance their own standing but increase respect for the profession. Among other things, personal appearance, general education and correct methods are important.

One fact I would like to stress. While money, of course, is important as a by-product in the practice of medicine, it should never be considered as an end in itself. It comes automatically. When we have rendered satisfactory service to our clients, we expect to be paid for it.

Discussion

Dr. J. S. Dick: I would like to ask Dr. Crawford if he has any suggestions to offer on how to keep his patients satisfied with only one reception-room. It seems to me one ought to have two or three.

Dr. Crawford: A man cannot have two or three reception-rooms. It would be impractical. When you take your distemper case into the examining-room, after you examine him, you either discharge him or put him in the distemper ward. Take him to the disinfecting table and clean your hands. One way I have found satisfactory is to have two doors. When the patient is examined, he goes out by a different door from the one he came in.

Dr. Dick: I have been unable to give satisfaction in this respect, and in the course of the year have lost several clients. They get mad and go home.

Dr. Crawford: Have a spring on the door so the people in the waiting-room cannot hear you discussing with your clients. Otherwise the first thing you know they will pack up, just as you say, and step out.

Dr. C. F. Schlotthauer: We have some interesting animals in iron cages down in Rochester, and if any of you men wish, we should be glad to have you stop in on the way down. We should also be glad to have any suggestions from you while there. We find the iron cages very practical. They are so arranged that the attendant can go through with a hose at any time, and without removing the dogs or disturbing them in any way. They are very practical, especially in distemper wards, where soiling is quite prevalent.

In regard to feeding, we have about 400 dogs all the time, and we practice feeding six days of the week. The seventh day they go without, not because it is Sunday, but because we have found that it is a good thing for the dog. Two days a week they get meat, two days they get hash (corn meal and meat) and the other two days dog biscuit. They are doing very well indeed.

Chairman: Do you use wire cloth for guards?

Dr. Schlotthauer: We use heavy inch-mesh wire.

Dr. J. C. Flynn: I enjoyed very much the paper on the hospitalization of dogs. I know from the statements made that Dr. Crawford wrote from actual experience. Particularly do I refer to the statements he made in regard to the cash deposit, sending out statements, and making it absolutely necessary that

the owner will return for the dog. I did not hear him mention, however, anything about his method of transporting the animals to and from the hospital. I presume he must be in a location where everybody has his own mode of transportation, which is increasing all the time, all over the country, and it probably is not necessary to have an ambulance there. I find, year by year, that an ambulance is less in use, but we need it. I find it is quite an addition to a small-animal hospital, both from the standpoint of convenience and the standpoint of advertising. We may be just a little bit delicate about advertising our business, too much so, but a well arranged, neatly kept ambulance, when properly handled, is quite an ad for the institution. It should be so arranged that it is safe and sanitary. I recall not long ago receiving a little complaint from a client because I charged $3.00 for delivering the dog home from the hospital. He said he could have hired a taxi for less. He was a large insurance man, and when I found he did not want to pay the $3.00, I wrote him something like this: "No doubt you could have hired a taxi for less, but your dog would not have been in the hands of a trained and experienced man, the taxi man would not have been responsible in case of accident, the car would not have been equipped comfortably for the dog, etc." And I sold him the idea. I believe an ambulance is quite an addition to a small-animal hospital even in this day, when nearly every man has his own car.

DR. CRWFORD: I appreciate Dr. Flynn's point. I think you people in the West are a little further ahead on this than we are in the East. We do not have one there. In my own practice I do not think an ambulance would be of any great assistance to me. When the time is up, the clients usually come and get the animals. While it may be very practical from your point of view, I do not see where it would affect me very much. We find it all right for the chauffeur to take the dog or to send him home in a taxi.

Wisconsin Speeds Tuberculosis Eradication

The exceptional progress of Wisconsin in eradicating tuberculosis from herds of the State has been cited by veterinarians of the U. S. Department of Agriculture as typical of the energy which dairy interests are devoting to this great cause. Much of the testing work in Wisconsin, it is noted, has been done under the handicap of extremely cold weather during the winter months, which makes the progress of the work especially noteworthy. Thirty-eight counties in Wisconsin are now classed by the Bureau of Animal Industry as modified-accredited areas, the infection being less than one-half of one per cent. Five additional counties have filed petitions and will be tested as soon as work can be arranged. Only four counties of the State have not yet filed petitions to have all the cattle tuberculin-tested. It is noteworthy also that more tuberculin tests were made in Wisconsin during 1928 than were made in a year in the entire United States seven years ago. Altogether, 1,560,289 cattle, nearly all dairy animals, were tested in the Badger State last year.

Mr. Wise Crack rises to ask: Who can remember when the streets were so quiet that you could hear a horse with the heaves?

SWINE POX

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During several years of routine diagnosis of swine diseases in this laboratory, it was observed that a peculiar skin eruption occurred in approximately 1 per cent of the herds represented. The disease was tentatively diagnosed as swine variola and has been so diagnosed in other laboratories. Such diagnosis was for a long time made with some hesitation. In an attempt to facilitate work in this laboratory and to remove doubt in our minds as to whether or not the condition is swine pox, some investigational work was inaugurated, the results of which are herewith presented.

Little or no American literature can be found dealing with this disease and but few reports are available in the European literature. Spinola[1] was the first to report swine pox, in 1842. Peiper[2] contended that human variola could be transmitted to swine and swine variola to man. Poenaru[3,4] infected healthy pigs with the blood and contents of lesions of pigs suffering from swine pox. He further found that the disease was due to a filtrable virus. Velu[5] reported swine pox in Morocco. He found it was often serious, at other times benign. In one herd of hogs there was a loss of 102 out of 130 in twenty days. He found no evidence that it was associated with pox, including vaccinia and smallpox, in other animals and humans. People were never accidentally infected, in spite of the conditions that prevailed in Morocco. To a great extent suckling pigs up to two to three months were affected. Old hogs were rarely infected. Rabbits, guinea pigs and rats were refractory. The blood of infected pigs contained the virus. Following variolization, the first lesions appeared at the end of the third or fourth day. Velu found that inoculation by scarification produced a benign form of the disease and felt that natural infection took place through the respiratory or digestive tracts. An attack of the disease did not prevent subsequent artificial inoculation with vaccinia. Glasser[6] notes that swine pox is most common in young pigs and states that although it is common in many countries, it is not usually a serious infec-

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tion except in the warmer countries, including Morosso, Algeria, Roumania and Hungary. Except in such countries, general disturbance with fever and weakness is rare. He says that the virus of swine pox is closely related to that of vaccinia and smallpox, and explains that swine have been infected with cow and sheep pox and that calves and sheep have been infected with swine-pox virus. The incubation period is from four to seven days. Glasser further states that either calf or pig lymph is used as a vaccine in warmer countries.

Steiner[7] reports the occurrence of pox in sheep and, a few days later, in the hogs on the same farm, with the loss of a number of pigs ten to fourteen days old. The udders of some of the sows nursing affected pigs showed pox lesions. No pigs older than fourteen days died.

General Observations

In this laboratory, the variola-like disease was observed in suckling pigs and in pigs up to about 200 pounds in weight, but not in aged hogs. It occurred at all seasons of the year. No marked general symptoms were recognized. Affected pigs showing evidence of generalized disturbance were found to be suffering at the same time from other diseases to which the symptoms were attributed, although in a few cases of bronchitis, pneumonia, pyemia and others, disease processes not apparently connected with the variola-like disease might have been secondary to it. There was no evident relationship between the eruptive dermatitis and other disease or diseases affecting the same animal simultaneously. The one disease seemingly did not alter the course of the other. All pigs in a herd were not affected, usually something less than 80 per cent.

Cutaneous Changes

Eruptive changes were most commonly found along the belly, inner sides of the legs and along the sides of the belly. When the lesions were very extensive they were also numerous higher along the sides of the body and less so along the back and about the face and ears. No lesions were found on the nose, lips, tail, anus or much below the knee or hock joints. It is rather difficult to observe minor changes in hog skin, and for this reason the more delicate initial changes might have been overlooked. The first change noted was a slightly elevated, reddish, congested area from one-half to one centimeter in diameter, the surface of which

FIG. 1. Portion of the skin of the belly of an affected pig showing the relative position and outline of the lesions, and the elevated individual lesions mostly with dark centers.

quickly changed to a lighter color, so that one had a feeling that he was looking into the tissue as if it were semi-transparent because of tiny vesicles forming, although no large vesicles were ever observed. In the center of this elevated spot the vesicular appearance changed to a gray area that became dark brown, shrunken and later scab-like.

About this central area the affected epidermis still retained its position, and with the depressed central area the whole appeared as an umbilicated or pox-like lesion. The central portion at times was not depressed below the surface of the lesion and might be elevated above. This portion had a diameter of one-fourth to two-thirds the entire diameter of the lesion. The central portion continued to dry, becoming harder; inflammation about it subsided so that it stood out above the general level of the skin and eventually fell off as a scab. From the time of exposure to dropping off of the scabs, a period of from four to five weeks elapsed in the limited number of pigs observed throughout the entire course of the disease. The incubation period was not less than six days and not more than sixteen days. Following recovery there was but little scar formation.

Sections for microscopic study were made from field cases, from accidentally infected cases and from one artificially infected case. Microscopically, the first lesion to appear was a dilation and filling of the more superficial capillaries of the corium at certain localized points, together with a slight swelling of the prickle cells and vacuolation in a few of the prickle cells in these areas. At this stage there was little or no leucocytic infiltration in the corium and no foreign cells in the epidermis. The cells of the affected portions of the epidermis, particularly the prickle cells, swelled to several times their normal size; their cytoplasm stained faintly. Swelling of the cells increased the thickness of the epidermis and gave the impression of hyperplasia but it was impossible to observe any marked increase in the number of cells. The increase in thickness of the epidermis, which was four to eight times that of adjacent normal tissue, was due rather to swelling of the cells.

Areas of vacuolation in the cell usually began near or around the nucleus. Seldom was there present in the same cell more than one vacuole, which increased in size and finally occupied nearly the entire cell area. The nucelus after its initial enlargement shrank in size, became shriveled, took odd forms until finally its site was marked only by small particles of chromatin which also

...the belly of an affected pig showing the relative position and outline of the lesions, and the elevated individual lesions mostly with dark centers.

FIG. 2 Section of the skin of an affected pig showing the developing lesion at X and the normal epithelium at O, near the edge of the lesion. An early stage. ×33.

disappeared, leaving only the borders of the cell which inclosed the vacuole and some small particles of degenerated cytoplasm. Vacuolar degeneration may be applied to the form of degeneration taking place in these cells. No multinucleated, degenerating cells were found.

A reticulum was formed by the remaining borders of the degenerated cells. The reticular material did not often rupture, so that there was not much evidence of communication between the different vacuoles. A breaking down of the reticulum took place in what might be termed the pustular stage. Evidence of fluid exudate coming from under the epidermis was not marked in the set of slides examined. Vacuolar degeneration depends to some extent on fluid exudate. The more superficial layers of the corneum were nearly always lost and often there was evidence that they had been pushed off by a collection of fluid under them. No collection of fluid between the degenerated cells was observed. The remaining opposing borders of the cells were in apposition.

Up to this time there had been no cellular infiltration of the epidermis but during the later stages there was a collection of leucocytes in the superficial portion of the corium. Degeneration and necrosis of the prickle cells first became complete just under the stratum corneum in the center of the lesion. Into this area infiltration with leucocytes took place. Evidently leucocytes were attracted by necrosis rather than by any virus present. In smallpox, Councilman[8] noted the late cellular infiltration of pox vesicles and offered the above explanation. Cellular infiltration continued from this point to the sides and depths of the degenerated and necrotic area. The reticulum also was destroyed, although not until the leucocytes had become necrotic or degenerated.

Involvement of the malpighian layer was not uncommon but usually only small areas were affected. Dessication and condensation began early and evidently in the center of the lesion. The entire infiltrated areas shrank into a granular, amorphic mass. Healing took place with growth of epithelium from the margin of the lesion when the malpighian layer was destroyed, also from the entire malpighian layer under the lesion when not destroyed. Cornification of the surface of the new epithelium took place, so that the dried mass of purulent material and cellular detritus was covered on the outside by the old, changed, cornified epithelium and under it was the newly formed stratum corneum. At or before this time the scab-like mass was rubbed off or lost.

...ulcerated pig showing the developing lesion at X and the normal epithelium at O, near the edge of the lesion. An early stage. x35.

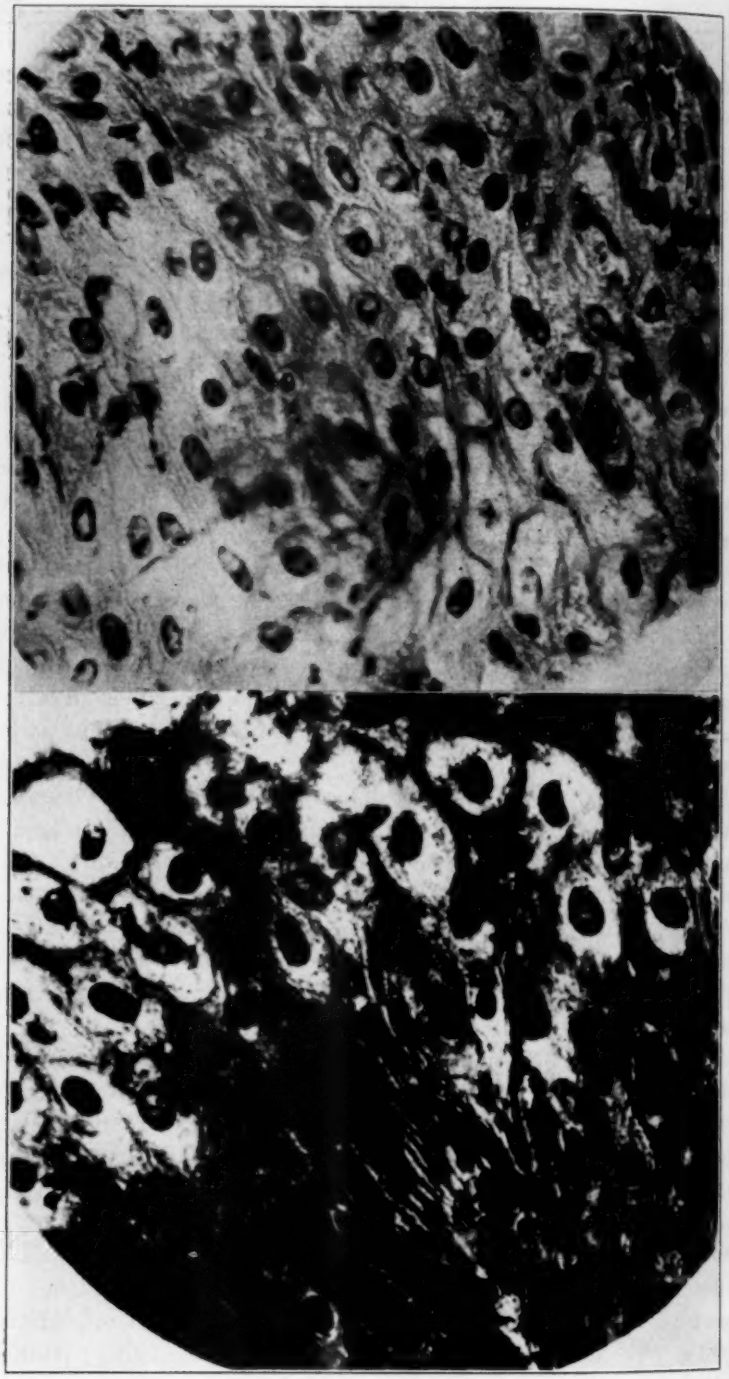

FIG. 3. (Above) Section of swine-pox lesion showing nuclear fragmentation and cytoplasmic vacuolization of the cells of the prickle cell layer. x620.

FIG. 4. (Below) Section of the epidermis through an early pox lesion. The unstained or only partly stained areas about the nuclei are vacuoles. The cell change here is a cytoplasmic vacuolization or what might be called vacuolar degeneration. x730

Umbilication seemed to be due to drying of the central part of the well-advanced lesion and to a more active inflammation about its circumference.

Secondary bacterial infection did not have a part in any of the limited number of slides examined. Bacteria were found in the later stages but then only on the very surface in any numbers. In the stage of vacuolar degeneration many cellular inclusions were noted, both in the prickle cells and in the columnar cells of the malpighian layer. Bodies were present in the cytoplasm and in the nucleus. Some of the bodies were evidently products of degeneration, others were not identified and no particular study was made of them. Eosinophiles were very numerous in the corium in the late stages, but were not noted in the epidermis.

To determine whether or not the disease could be transmitted, two rabbits and one pig were inoculated. The rabbits were shaved over the thigh and the skin scarified with a blunt-pointed needle that had first been scratched through fresh lesions of affected pigs. Inoculation was made on November 22 and, on November 27, a few small pimples were noted along the needle scratch. These quickly healed. On November 24, one pig, weighing 50 pounds, was inouclated by scarification on the right side. On December 9, well-developed pox-like lesions were present over the belly, inner surfaces of the legs and on the sides to some extent, but very few were present in the region of inoculation. The pig was killed on December 23. From the time of inoculation up to the time it was killed it showed no general symptoms. It ate its feed well and was bright and active.

Sections made from lesions experimentally produced in this pig were identical with those found in field cases. Gross appearance of the lesions also was the same as in field cases. In a pen 40 feet from the above inoculated pig there were other pigs ranging in weight from 40 to 100 pounds. On December 27, or 18 days after the inoculated pig first was noticed to show lesions, perhaps 6 per cent of these pigs were found to be showing pox-like lesions, grossly and microscopically identical with those observed in field cases. It was impossible to determine just how many of these pigs would have contracted the disease or whether or not they showed any generalized symptoms, because they had been inoculated with hog cholera virus and were sick with that disease at the time. The eruptive skin disease did not alter the course of cholera. It was thought that the virus of the variola-

FIG. 5. (Above) Section of the epidermis through an early lesion. Cyptoplasm of the cells in the central area has disappeared leaving only the vacuole about the changed nucleus. Cells showing beginning changes also present.

FIG. 6. (Below) A pox lesion nearly healed; loosening of the scab and formation of new epithelium under it.

like disease may have been carried by mice as there were great numbers of these running about the building.

Evidence that the disease is swine pox is afforded by the gross general character of the lesions, the development and healing of the lesions, and that it is a highly infectious, contagious affection of young pigs. Further, microscopic study shows that the initial lesion with its degeneration of the epithelial cells, the late infiltration with leucocytes, and the healing process are all quite typical of pox in other animals. Our findings are in accord with those of Velu[5] in that rabbits were refractory to inoculation. The course of the disease, the absence of serious losses and serious symptoms, and the healing and recovery as observed here are much like the disease known as swine pox in Germany and described by Glasser.[6] Absence of serious losses is explained by Glasser when he says that swine pox is most apt to be benign in temperate climates. The only objection that might be raised to the term pox is that vesicles of any size were not found and that pustules such as those present in smallpox and cow pox were not observed. It is possible that large vesicles and true pustules can develop in what is known as swine pox, but detailed descriptions of such are not available. Again, it should be remembered that swine pox is rather distantly related to small pox and cow pox. Rivers,[9] in his list of filtrable viruses, holds that swine pox is more closely related to pox of horses, sheep and goats in that they are all equally distantly related to smallpox and cow pox. Absence of true pustules cannot be explained on the ground that the cases observed were abortive. They were mild but not abortive. However, there are often different forms of pox in the same species of animals.

On the basis of the above it is proposed that the disease be known as swine pox or swine variola.

REFERENCES

[1]Spinola: Krankheiten d. Schweine (1842) p. 204.
[2]Peiper: Die Pockenimpfung (1901), p. 20.
[3]Poenaru: Arch. Vet. (Bucarest), lxvii (1907).
[4]Poenaru: Bul. Soc. Centrale Med. Vet. (March 30, 1913), p. 148.
[5]Velu: Recueil Med. Vet., xcii (1916), pp. 24-30.
[6]Glasser, K.: Die Krankh. des Schweines (Hannover, M. & H. Schaper, 1927).
[7]Steiner: Zeit. f. Vet. Jahrg, xxix (11), p. 474.
[8]Councilman, W. T., Magrath, G. B. and Brinkerhoff, W. R.: Jour. Med. Res., xi (1904).
[9]Rivers, T. M.: Jour. Bact., xiv (1927), p. 217.

Antirabic Vaccination in Charleston

According to a report published by the health officials of Charleston, S. Car., 1248 dogs were vaccinated against rabies at city and county public clinics during the past summer, and owners of about 150 dogs had them vaccinated privately.

VACCINATION AGAINST FOWL POX

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Immunity to fowl pox usually develops as a result of an attack of the disease. The occurrence of such an immunity has stimulated attempts to produce a resistance to the disease by various methods of vaccination.

The vaccinating material generally used has been fowl-pox virus, either in an unaltered or an attenuated form. The use of an unaltered virus, that is, the direct transfer of pox virus from infected to susceptible fowls, should not be employed as a general means of vaccination, owing to the danger of spreading the infection. Various methods of attenuating the virus have been used with the object of rendering it non-pathogenic without destroying its immunizing properties.

Manteufel,[1] in 1910, first reported successful immunization of fowls by injecting into the circulation or beneath the skin of susceptible birds a suspension made from fowl-pox lesions. The scrapings from the comb or mucous membranes of the head of diseased birds were mixed with physiological salt solution and heated at 55° C. for one hour. Both immunizing and curative values were claimed for this method of vaccination.

Results obtained by the use of a vaccine made according to the method of Manteufel were reported by Hadley and Beach[2] (1913) and Mack and Records (1915-1916).[3,4] According to these workers, the vaccine was an effective means of preventing the disease and also possessed curative value.

In 1920, Beach[5] reported that an immunity or resistance of variable duration was obtained by using a standardized vaccine prepared from the scabs of comb lesions. The vaccine was prepared by adding one gram of the dried virus to one hundred cubic centimeters of physiological salt solution. It was heated for one hour at 55° C. and 0.2 per cent of tricresol was added as a preservative. The vaccine was recommended for controlling the disease in infected flocks rather than as a means of prevention.

Boerner and Stubbs,[6] in 1921, reported unfavorable results from the use, in infected flocks, of vaccines prepared according to

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both the Manteufel and Beach methods. Fuller, in 1924,[7] and Gwatkin,[8] in the same year, reported that favorable results were obtained in outbreaks of the disease from the use of a vaccine prepared after the method of Beach.

Van Heelsbergen,[9] in 1925, reported on the use of a cutaneous method of vaccination. The vaccine (called anti-diphtherin) was applied to the skin follicles. The method of preparing this vaccine was not described but was claimed to contain living vaccination material, unattenuated either chemically or physically. Fowls treated with this vaccine were protected for a long period of time against natural as well as artificial infection.

During 1927, Beach[10] reported further studies in immunization of fowls against pox by the subcutaneous injection of vaccines. A vaccine prepared by mixing finely ground fresh pox lesions with a glycerin-phenol-salt solution was reported as giving the most satisfactory results. The immunity or resistance resulting from the use of this vaccine was shown to be of long duration.

Johnson,[11] in 1927, reported on a cutaneous method of vaccination which was designated as "virus-vaccination." An aqueous or glycerin suspension of finely ground pox scabs was applied to follicles of the skin of the leg from which the feathers had been removed. This vaccination was claimed to produce an immunity against both experimental and spontaneous infections.

In the autumn of 1926, the writers vaccinated fowls using the cutaneous method of inoculation as suggested by DeBlieck and Heelsbergen. The vaccine for this purpose was prepared with scabs taken from comb lesions of artificially infected cockerels. Comb scabs from cockerels having marked lesions were used for the production of the vaccine. Lesions on the comb usually are sufficiently developed to yield suitable material for vaccine preparation in from nine to fourteen days following inoculation with a virulent virus.

The scabs and sub-lesion epithelial tissue were dried in a partial vacuum over sulphuric acid. When thoroughly dry they were placed in glass vials, well stoppered and stored under refrigeration conditions. In preparing the vaccine the dried scabs were triturated to a fine powder in a mortar. One gram of the powdered pox scabs was thoroughly mixed with four cubic centimeters of a glycerin-phenol solution, composed of 50 parts glycerin, 1 part phenol and 49 parts water. The vaccine was used within a short time after its preparation, as it is generally conceded that a fresh active virus gives the highest percentage of immunity reactions.

Several groups of fowls were inoculated by applying the vaccine to a small scarified area of the skin of the thigh from which the feathers had been plucked. The cutaneous inoculations were marked by the formation of heavy scabs in from ten to fourteen days after vaccination. Nine months later, immunity tests were conducted by applying a virulent pox virus to the scarified combs of these birds and all showed complete resistance to this infection.

During the fall of 1927, over 1500 pullets were vaccinated on four farms and 469 unvaccinated birds were retained as controls on the spread of pox from the vaccination. In the majority of cases the vaccine was applied to a scarified area of the skin of the thigh. The others were inoculated by plucking only a few feathers. The vaccine was prepared according to the method already mentioned, with the exception that ten instead of four cubic centimeters of the glycerin-phenol solution were used to each gram of the dessicated scabs. Fowl pox had occurred on these farms during the previous year, but no cases were observed at the time of treatment.

Following vaccination a slight general depression was observed in some flocks. The birds were less active and food consumption was reduced. This depressing effect became most apparent during the second and third weeks after vaccination. In one flock there was evidence of roup at the time of treatment and vaccination did not appear to increase the severity of the disease. Pox lesions developed in a few of the untreated birds in these flocks and the disease was apparently of a mild nature in all but one flock. In this flock a number of deaths were attibutable to fowl pox. No pox was reported as occurring in these flocks during the ensuing winter.

Some undesirable reactions have been reported following cutaneous vaccination. It may be possible, as suggested by Johnson, to limit the general depression by using a less extensive skin abrasion in vaccination. If this be true, it is important to determine the extent of the abrasion necessary to produce a satisfactory immunity. Feather plucking is a more simple method of skin preparation that scarification and an experiment has been conducted to determine the relative merit of the two methods. An effort also was made to ascertain the minimum number of feathers that should be plucked to obtain a suitable reaction.

In this test four methods of vaccination were used: scarification of a defeathered portion of the skin; plucking of one feather; plucking of five feathers; plucking of ten feathers.

White Leghorn pullets, six to seven months old, that had been reared in pox-free surroundings were vaccinated January 24, 1928, and held indoors until the experiment was terminated four months later. They were grouped in four pens, each containing fourteen birds. Preparatory to application of the vaccine the birds in pen I each had one feather, pen II, five feathers and pen III, ten feathers plucked from the region of the thigh. In pen IV, in addition to the plucking of feathers, a skin area of approxmately 1 sq. in. was superficially scarified. The upper region of the tibia was used as the seat for vaccination and the vaccine was applied with a small, round brush, the bristles of which were cut to give a desired stiffness.

The birds were examined on the seventh and fourteenth days following vaccination and reactions as indicated by enlargement of the feather follicle or scab formation were recorded. All birds with the exception of two in pen I gave evidence of a reaction. During a period of thirty days immediately following vaccination, two birds died; one from pen II had an adherent cheesy mass in the superior larynx; the other, from pen IV, showed no lesions suggestive of pox infection.

Unfortunately a rather high mortality was experienced in the pullets during the four months following vaccination. Evidence of nutritional disturbance was present, probably due to the quality of cod-liver oil used in the diet. This assumption finds support in the fact that leg weakness developed in young fowls when oil from the same source was used in their feed.

An immunity test was conducted May 5, 1928, four months after vaccination. At this time there were eight fowls in pen I, twelve in pen II, six in pen III and twelve in pen IV. This test was conducted by applying a virulent pox virus to the scarified comb of the vaccinated bird. The virulence of the virus was controlled by a similar application to young susceptible cockerels. Two birds in pen I and one in pen II showed very slight elevations on the scarified combs. These reactions were very mild and transient in character. The remainder of the birds showed no evidence of a reaction to the test.

The feather follicle method of vaccination in this test appeared to produce an immunity equally satisfactory to that of cutaneous scarification. While the removal of a single feather is sufficient to produce an immunity, the greater assurance of a "take," when five to ten feathers are removed, makes this method of procedure more reliable. What the maximum duration of the immunity

might have been was not determined although at the end of four months the immunity remained practically complete.

The results that were obtained in the use of the cutaneous method of virus vaccination support those already reported by other investigators. While definite conclusions should not be made from the data obtained in the use of so limited a number of birds, they do furnish a basis from which a few suggestions for control of fowl pox may be formulated.

The cutaneous method of vaccination, either by scarification of the skin or by plucking of several feathers, produces an immunity that withstands attempts at severe artificial infection. The immunity appears to be equally firm following vaccination by either scarification or feather plucking.

The simplicity, ease and rapidity with which the vaccine can be applied particularly recommend the feather-follicle method of vaccination. While immunity can be established by applying the vaccine to a single feather follicle, the plucking of five to ten feathers is recommended, as it gives additional assurance of a suitable "take." The development of a pox lesion at the seat of inoculation is regarded as evidence of a favorable immunity reaction.

Healthy young fowls from four to seven months of age may be vaccinated without danger of causing a harmful chicken-pox infection. All susceptible fowls on the premises should be vaccinated. Vaccination of pullets while on range and before the combs are fully developed is recommended. The probability of comb-pecking and resulting infection is much less when the birds are on range than when housed. Obviously the small combs offer less opportunity of pox development than do those that are fully matured.

Evidence suggests that when young fowls are vaccinated during the summer or early fall, they will be protected against fowl-pox infection during the following winter and spring. Vaccination of laying flocks by this method, in its present stage of development, is contraindicated as the birds may be thrown out of production. The vaccine may be administered in flocks in which there is an outbreak of fowl pox without increasing the severity of the lesion in fowls already infected, or hastenng the spread of the infection among the other birds.

The use of a vaccine on a farm where fowl pox has never existed is not advisable, especially when conditions are such that the infection is not likely to be introduced. Recently vaccinated

birds should not be introduced into a pox-susceptible flock. Routine vaccination should be practiced only on farms where the disease has occurred.

REFERENCES

[1]Manteufel: Beiträge zur kenntniss der immunitäteserscheinungen bei den sogennanten geflugelpocken. Arb. Kaiserl. Gesundh., xxxiii (1910), p. 305.
[2]Hadley and Beach: Controlling chicken-pox (sorehead or contagious epithelioma) by vaccination. Proc. 50th Ann. Meet., A. V. M. A. (1913), pp. 704-712.
[3]Mack and Records: The control of contagious epithelioma in chickens by vaccination. Nevada Agr. Exp. Sta. Bul. No. 82, (1915).
[4]Mack and Records: Contagious epithelioma in chickens. Its control by vaccination. Nevada Agr. Exp. Sta. Bul. No. 84, (1916).
[5]Beach: The diagnosis, therapeutics and prophylaxis of chicken-pox (contagious epithelioma) of fowls. Jour. A. V. M. A., lviii (1920), n. s. 11 (3), pp. 301-312.
[6]Boerner and Stubbs: Experiments to determine the value of chicken pox vaccine. Jour. A. V. M. A., lx (1921), n. s. 13 (1), pp. 83-91.
[7]Fuller: The latest method in the control of chickenpox and roup by vaccination. Jour. A. V. M. A., lxiv (1924), n. s. 17 (5), pp. 619-622.
[8]Gwatkin: Some notes on avian diphtheria (chicken-pox). Rpt. Ont. Vet. Coll. (1924), p. 54.
[9]van Heelsbergen: Vaccination against diphtheria and fowl pox with antidiphtherin. Vet. Rec., v (1925), 24, pp. 481-483.
[10]Beach: The immunization of fowls against chicken-pox (epithelioma contagiosum) by subcutaneous injection of virus. Hilgardia, iii (1927), 3.
[11]Johnson: Fowl-pox prevention by immunization. Jour. A. V. M. A., lxxi (1927), n. s. 24 (6), pp. 750-763.

Prize Essay Contest

Announcement has been made that the Massachusetts Society for the Prevention of Cruelty to Animals would award a prize of $250 for the best answer to the question: "How Humanely, and at the Same Time Effectively, Can a Dog Be Trained to Guard Himself from Injury by the Automobile." It is reported that, on an average, two dogs a day, maimed or fatally injured by cars, are brought to the Angell Memorial Animal Hospital in Boston. The contest is nation-wide and answers must be limited to 1500 words.

DISTINGUISHED SCIENTISTS

Dr. P. P. Laidlaw (left) and Major G. W. Dunkin, who have developed a method for the active immunization of dogs against distemper.

STARCH DIGESTION IN THE DOG

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It has long been known that starch may be digested and assimilated in carnivora. Hofmeister[1] fed starving dogs five grams of starch per kilogram and produced glycosuria. Most investigators fail to report whether the starch used was raw or cooked and we may assume that it was not raw starch in their experiments. If dogs can utilize starch, the fact should be common knowledge among veterinarians. From casual observations we may conclude that many are ignorant of this important fact. We see this prevalent notion reported in a trade journal: "There are no starch-digesting juices in the alimentary tract of the dog." This seems to be the usual attitude on the part of the veterinarian. It is difficult to account for this error. Perhaps it is due to such contributors as Carlson and Ryan[2]: It is commonly held that the saliva of carnivora contains no ptyalin "or starch-splitting enzyme." This has been confirmed by many investigators.

If it is true, as seems likely, that dog's saliva cannot digest starch, it does not exclude the possibility of starch and other carbohydrates being digested by the pancreatic and intestinal juices. Sherman and Schlesinger[3] state: "The diastatic action of the dog's pancreatic juice is quite similar to that of man."

We are also warned against the use of certain vegetable foods such as potatoes and macaroni. Many have observed, after potato feeding, that large, solid pieces are evacuated in the feces, and have supposed these to represent indigestible fragments of the potato. We find these pieces to be cellulose which have taken up large quantities of water and contain no starch.

Experimental

A. In Vitro

1. In the experiments reported in table I, the source of the digesting substance in the dog was obtained either (1) direct from the submaxillary duct, (2) as mixed saliva, which is not reported, (3) an alcoholic extract of the gland or (4) direct from the pancreatic duct following the injection of "secretin." In order to secure some comparison with a recognized omnivorous animal,

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the pig was selected. The digesting substance in this case was an alcoholic extract of the fresh hog pancreas obtained from a local packer.

TABLE I—*Amylolytic activity of digestive glands**

(5cc of 1% starch plus 1 cc gland material)

MINUTES DIGESTED	DOG PANCREAS† (MG.)	PIG PANCREAS† (MG.)	DOG (SUBMAXILLARY DUCT) (MG.)
30	18.72	18.72	14.6
60	24.0	24.0	19.5
90	26.0	27.1	21.4
105	27.35	27.35	23.3
120	27.35	27.35	24.0

*Expressed in milligrams of glucose.
†Alcohol extract.

As little difference existed between the material obtained direct from the pancreatic duct and an alcoholic extract, the latter is the only one reported. These figures represent an average of many trials.

No attempt was made to compare the material from salivary glands, nor are any data reported on the activity of mixed saliva compared with any specific gland, as the former proved too slow in comparasion.

2. The procedure was to subject the various digesting solutions to a temperature of 39° C. in a constant-temperature water-bath. These solutions represented the following ratio: 1 cc of digesting substance to 5 cc of 1 per cent boiled starch paste and digested for varying periods of time. Before titration, especially as digestion progressed, the digesting mixture was further diluted, 1 cc to 5 cc of distilled water and titrated with Benedict's quantitative solution. During digestion a check was kept with starch-iodin test, as this test appeared to check roughly with Benedict's test.

B. In Vivo

1. Experiment animals: The dogs used in these feeding experiments were puppies, litter mates and adult animals. For convenience they were numbered 1, 2 and 3.

No. 1. A mongrel female, about 4 months of age, weight 3.2 kilos (7 lbs.).

No. 2. Mongrel female, about 4 months of age, weight 1.7 kilos (about 4 lbs.).

No. 3. Mongrel female, aged, and weighing 13.6 kilos (30 lbs.).

At the beginning of the experiment, dog 3 gave birth to a litter of puppies, all of which died for one reason or another. Later when dog 2 was removed from the experiment this dog was used. The weight of all the dogs was maintained throughout the duration of the experiment.

2. *Preparation of the dogs:* Following a fast of 24 hours, arecolin hydrobromid, 1/10 grain, was given and the dog again washed out. As a basic diet we found that raw lean hamburger answered our purpose best. During the preparation of the dogs, tests were made of "washes" from the large intestine.

3. *Method of feeding:* In the earliest experiments a 2 per cent cooked starch paste was fed, either by stomach-tube or by carefully pouring it in the side of mouth. Later raw starch was fed in a suspension of cold water. Raw starch was fed also in capsules. As the amounts of starch fed increased, raw lean hamburger was incorporated into the very thick cold paste of starch. Bouillon cubes also were fed in the earliest work. The dogs were fed but once in 24 hours. The feed and amounts are reported in table II.

4. *Method of handling:* During these experiments the dogs were kept in cages especially built for metabolism work. The urine and feces when voided were collected. As the diet fed was not conducive to feces formation, little or none was collected.

5. *Irrigation of the large intestines:* The "wash" for analysis was obtained by restraining the dogs on a surgical table tilted at an angle. Water at body temperature was used to scrub out the bowel. A large soft catheter (No. 17F) with suitable perforations along the sides facilitated the scrubbing operation. In an effort to ascertain more thoroughly the nature of the contents of the small intestine and stomach, following the usual wash, 24 hours after last meal, dog 1 received and retained sufficient water to pass through the ileo-cecal valve and flush out the entire gastro-intestinal tract. The result of this analysis is given under "Vomit." The starch iodin test was used at this period. Regardless of the sensitivity of this test in the presence of starch, a positive reaction never was obtained.

Two rather interesting observations were made in wash material. One was in the wash of the potato-fed dogs. Whereas the wash contained what appeared to be potato, on further tests this material appears to be cellulose, void of all starch-reacting material. As this cellulose resembles potato very closely, it no doubt has some bearing on the supposition that dogs are unable

to digest potato. The other was the complete absence of residue on the macaroni feeding.

6. Hydrolysis and titration: The wash was acidified with concentrated hydrochloric acid and boiled for 45 minutes, neutralized, filtered and tested quantitatively with Benedict's solution for reduced substances. The results of these tests are tabulated in table II.

TABLE II—*Total reducing substance in "wash."**

Dog	Diet: Raw Starch† (Grams)	Diet: Boiled Macaroni (Grams)	Diet: Boiled Potato (Grams)	Diet: Raw Hamburger (Grams)	Diet: Bouillon Cube	Analysis: Amount "Wash" (cc)	Analysis: Starch Iodin Test	Analysis: Total Reducing Substance In "Wash" In Milligrams
1	6					500	Negative in all cases	Negative
2	4					500		Negative (10)
1		175	½			500		Negative (31)
2		125	½			500		Negative (25)
1		150	1			500		Negative
2		40	1			600		Negative
1		100	½			500		Negative (60)
2		100	½			500		Negative (60)
1				200		500		Negative
2				160		500		Negative
1				145		500		Negative (100)
2				145		500		Negative (100)
1	12					400		Negative
2	12					400		Negative
1	20				180	800		Negative (80)
2	20				180	550		Negative (50)
3	30				200	800		Negative (76)
1	30				100	600		Negative (150)
3	75				200	600		Negative (150)
1	50				125	600‡		Negative (120)
						600 vomit		Negative (90)
3	200				250	1000		Negative (150)

*The "wash" referred to is the water with which the intestines were scrubbed.
†Argo Gloss laundry starch.
‡After washing dogs in usual way, sufficient water was given and retained until animal vomited.

CONCLUSIONS

1. It would appear that dogs are capable of digesting and assimilating starch, both raw and cooked, even in large amounts.

2. The salivary secretions as well as the pancreatic juices appear to contain amylolytic power.

3. It would appear from our feeding experiments that potato and macaroni, in reasonable amounts, are efficiently handled by dogs both young and old, the prevailing opinion to the contrary nothwithstanding.

4. The residue resembling fragments of potato, in the feces of dogs fed on this tuber, appears to be chiefly cellulose, void of all starch and as such not capable of digestion.

5. It would appear from these experiments that an alcoholic extract of dog pancreas is as efficient in diastatic power as those of the pig pancreas. Further studies are now in progress.

REFERENCES

[1]Hofmeister: Quoted by Allen, "Glycosuria and Diabetes" (1913).
[2]Carlson, A. J. & Ryan, J. G.: Amer. Journ. Physiol., xxii, 1.
[3]Sherman and Schlesinger. Jour. Amer. Chem. Soc., xxxv, 1784.

Many Herds Await Test

More than 2,000,000 cattle were on the waiting-list for tuberculin testing, at the end of 1928, according to a statement recently issued by the U. S. Department of Agriculture. This fact, according to B. A. I. veterinarians, indicates an attitude of effective cooperation on the part of stock-raisers and dairymen generally, and also that the 1929 record of tuberculin tests is likely to rank high in comparison with other years.

On January 1, a total of 629 counties in the United States had been recognized as modified-accredited areas, signifying that after tests the Bureau of Animal Industry regarded them as practically free from bovine tuberculosis; and cattle in accredited herds numbered 2,164,105. More than 23,000,000 cattle are in herds under B. A. I. supervision for the eradication of tuberculosis, and the waiting-list on January 1 numbered 2,160,517 cattle. In thirty-three states the demand for testing has outstripped the facilities for prompt response to applications, but the work of testing is proceeding rapidly. The test was administered to 845,971 cattle in December.

STUDIES CONCERNING THE CALMETTE-GUERIN METHOD OF VACCINATING ANIMALS AGAINST TUBERCULOSIS

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In August, 1924, a culture of Bacillus Calmette-Guérin, or B.C.G., as it is termed for convenience, was obtained from the Pasteur Institute, Paris, through the agency of former State Senator Nathan Straus, Jr., of New York. Stock cultures of this organism have since been carried on potato medium. When a large quantity of B.C.G. was required for vaccinating purposes, it was transferred to Sauton's liquid medium.

HISTORY OF B.C.G.

This organism was originally cultured from a bovine tuberculous lesion. In 1908, Prof. A. Calmette, of the Pasteur Institute, Paris, seeded it on a glycerin-bile-potato medium and, after cultivation on this medium for several years, he observed, through animal inoculation, that it was gradually losing its virulence. In 1920, he claimed that it had lost its virulence for all species of animals and, as a result of experiments on cattle, apes and monkeys, made the startling statement that vaccination with B.C.G. rendered considerable, if not complete, immunity as long as this organism remained in the body of the vaccinated animal. Calmette accepted the term "premunization" rather than "immunization" to describe this symbiotic relationship between the host's body cells and B.C.G. In other words, B.C.G. remained in the body of the host without causing progressive tuberculosis lesions and, as long as it did so, prevented virulent tubercle bacilli, even though they were actually present, from forming progressive lesions.

VIRULENCE TESTS

In order to determine whether B.C.G. was wholly innocuous for animals, the following tests were made in December, 1924, using chickens, rabbits, guinea pigs and cattle.

Chickens: Six chickens were inoculated, each with 4.5 mg. of B. C. G., three subcutaneously and three intramuscularly. One

*Died January 24, 1928. With the exception of the immunity test in guinea pigs, this investigation was planned by, and carried to completion under the supervision of, Dr. Schroeder before his death, and the conclusions are in concurrence with his belief.

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of each group was killed two months later but no lesions could be observed on postmortem examination. The remaining four fowls were killed two years after inoculation and all were apparently free from tuberculosis.

Rabbits: Six rabbits were inoculated, three subcutaneously, each with 4.5 mg. of B. C. G., and three intravenously, each with 2 mg. Three died of intercurrent infection, the first, 10 months, and the last, 23 months, after inoculation. The remaining three were killed 30 months after inoculation. None of the six showed lesions of tuberculosis.

Guinea pigs: Two series of guinea pigs were inoculated. The first series comprised 12 animals, six of which each received a subcutaneous injection of 3.3 mg. of B. C. G., and six each 3.3. mg. intraperitoneally. One of the latter group died 30 months after inoculation, of chronic pericarditis. The remaining 11 guinea pigs were tested intradermically with tuberculin without reaction, 31 months after inoculation. They were then killed and found free from tuberculosis.

A second series of guinea pigs, 36 in number, was inoculated intraperitoneally, each with 5 mg. of B. C. G., in March, 1926. One died in March, 1927, showing lesions of generalized tuberculosis. Acid-fast organisms were found on microscopic examination, and guinea pigs inoculated with the tuberculous tissue of the dead animal died within two months, of generalized tuberculosis.

Six other animals of this series of 36 died of intercurrent infection, none showing lesions of tuberculosis. The remaining 29 were killed in February, 1928, or 23 months after being injected and all were found free from tuberculosis. It would be impossible to state whether the one guinea pig of this series, which died of tuberculosis, contracted the disease as a result of the inoculation with B. C. G., or whether this was a case of "spontaneous" tuberculosis. These animals were kept in a house in which guinea pigs used in other experiments were kept, some of which were affected with tuberculosis. When guinea pigs are kept in such an environment for a considerable period of time, there is always a possibility of "spontaneous" tuberculosis. There are records of several such cases at this station.

Cattle: One bovine animal, 17 months old, free from tuberculosis, was given an intravenous injection of a suspension of 25 mg. of B. C. G. monthly for six months. Three months after the last injection, the animal was killed. No lesion of tuberculosis was

observed on postmortem examination. During the entire period of the test, the animal remained in uniformly good health.

Specificity of B. C. G.

Tests made at this station revealed the following facts:

1. Guinea pigs inoculated intraperitoneally with B. C. G. are made sensitive to mammalian tuberculin but not to avian tuberculin. This sensitization persists for at least four months after inoculation.

2. Old tuberculin (O. T.), prepared from cultures of B. C. G. grown on Sauton's medium and tested on guinea pigs sensitized by mammalian tubercle bacilli, was shown to be equal in potency to standard tuberculins.

It is apparent, therefore, that B. C. G. is a mammalian tubercle bacillus, and that, while the organism has apparently become avirulent during its long cultivation on laboratory media, it has not suffered a corresponding loss of antigenic and tuberculinogenic properties.

Immunity Tests in Guinea Pigs

An experiment was made to determine the comparative resistance to tuberculosis of normal guinea pigs, and guinea pigs immunized with B. C. G. and killed tubercle bacilli, respectively. In this experiment, three groups of 50 guinea pigs each were used.

Group I: Fifty healthy guinea pigs, averaging 450 grams in weight, were placed in a large holding-pen. On November 26, 1926, each animal received an intraperitoneal injection of 10 mg. of B. C. G.

Group II: Fifty similar guinea pigs were placed in another holding-pen, and on November 23, November 27 and December 1, 1926, were each given intraperitoneal injections of 3, 4 and 5 mg. of killed human tubercle bacilli respectively, each animal receiving a total of 12 mg. of killed organisms.

Group III: Fifty similar guinea pigs were placed in another holding-pen as controls on groups I and II.

Starting January 6, 1927, or 35 days after the last immunizing injection, each group was exposed to tuberculosis by placing virulent tubercle bacilli, bovine type, in their drinking water. Twenty-two feedings of 15 mg. to each group were made, over a period of eight weeks. The last feeding was made February 28, 1927.

The deaths in the different groups are shown in table I.

TABLE I.—*Deaths in three groups at monthly intervals*

NUMBER DEAD	GROUP I (B.C.G.)	GROUP II (K.T.B.)	GROUP III (CONTROLS)
June 1, 1927	0	0	6
July 1, 1927	0	1	8
August 1, 1927	0	5	21
September 1, 1927	4	14	28
October 1, 1927	7	22	39
November 1, 1927	20	32	43
December 1, 1927	22	40	47
January 1, 1928	29	42	48
February 1, 1928	38	48	49

Of the guinea pigs alive after February 1, 1928, the deaths were gradual, the last animal in group I dying in September, 1928; in group II, July, 1928; and in group III, March, 1928. Only three guinea pigs of the entire 150 died of intercurrent infection and these occurred before tuberculosis was manifest.

The results of this test show that in guinea pigs a resistance to the spread of tuberculosis is established as a result of vaccination with killed tubercle bacilli and B. C. G., being slight with the former and well marked with the latter. That this is only an increased resistance rather than a true immunity is shown by the fact that all animals in each group (except 3 mentioned heretofore) died of tuberculosis, the generalization of the disease being merely delayed in the B. C. G. and K. T. B. groups.

A somewhat similar experiment is now in progress, in which two groups of guinea pigs were vaccinated, one orally and one intraperitoneally, during the first ten days of life, with suspensions of B. C. G. A third group for control was added and all exposed by feeding virulent tubercle bacilli. This experiment has not progressed sufficiently to warrant conclusions. The purpose of this experiment is to determine the relative merits of oral and intraperitoneal vaccination, since Calmette advocates the vaccination of infants by three feedings of B. C. G. during the first ten days of life.

IMMUNITY TESTS IN CATTLE

Vaccination experiments in cattle were begun in January, 1925. Cattle were vaccinated either subcutaneously or intravenously with suspensions of B. C. G. as advocated by Calmette. The method and date of vaccination and dosage for each animal are shown in tables II, III, IV and V. The vaccinated animals were divided into four groups, according to the method of subsequent exposure to tuberculosis, as follows:

I. Intravenous injection of virulent tubercle bacilli.
II. Subcutaneous injection of virulent tubercle bacilli.
III. Feeding of virulent tubercle bacilli.
IV. Natural exposure or placing in contact with known tuberculous animals.

A control animal was used for each vaccinated animal.

Results

Group I. Exposure by intravenous injection of virulent tubercle bacilli:

Two vaccinated and one control (see table II), killed about 12 months after vaccination, or 8 months after exposure. One control died of miliary tuberculosis. The other control and the two vaccinated animals showed practically the same degree of infection. Neither vaccinated animal was protected against tuberculosis, but the lesions were comparatively greater in the control animals.

Table II.—*Exposure by intravenous injection of 1 mg. of virulent bovine tubercle bacilli*

Cattle No.	Method of Vaccination	Date of Vaccination	Date of Exposure	Result
1188	Intravenous (40 mg. B.C.G.)	Jan. 7, 1925	May 25, 1925	Killed, Jan. 11, 1926. 4 tubercles in parenchyma of lungs from 3 to 10 mm. in diameter; bronchial, mediastinal and portal glands tuberculous
1140	Subcutaneous (100 mg. B.C.G.)			Killed, Jan. 13, 1926. Lungs contained 1 tubercle 4 mm. in diam. Few lesions in bronchial and mediastinal glands
1152	Controls			Killed, Jan. 6, 1926. Lesion on neck at site of intravenous injection. Slight lesions in bronchial and mediastinal glands. 25 translucent areas on surface of lungs and one 1-cm. tubercle in parenchyma. 1 tubercle in liver
1189				Died, July 19, 1925, of miliary tuberculosis. Lungs completely studded with miliary tubercles. Bronchial and mediastinal glands greatly enlarged and tuberculous

Group II. Exposure by subcutaneous injection of virulent tubercle bacilli:

Two vaccinated and two control animals (see table III), killed about 12 months after vaccination, or 8 months after exposure. One control animal showed generalized lesions of tuberculosis. In the other control and the two vaccinated animals, the tuberculous lesions were confined to abscesses at the site of inoculation under the skin of the neck and in the adjacent prescapular lymph-gland.

In this group, also, both vaccinated animals showed lesions of tuberculosis but comparatively less extensive than the controls.

TABLE III.—*Exposure by subcutaneous injection of 5 mg. of virulent bovine tubercle bacilli*

CATTLE No.	METHOD OF VACCINATION	DATE OF VACCINATION	DATE OF EXPOSURE	RESULT
1213	Intravenous (40 mg. B.C.G.)	Jan. 7, 1925	May 25, 1925	Killed, Jan. 14, 1926. Tuberculous tumor 6 in. x 2.5 in. at site of inoculation of virulent tubercle bacilli. Adjacent prescapular gland greatly enlarged and contained abscesses filled with creamy pus
1171	Subcutaneous (70 mg. B.C.G.)			Killed, Jan 15, 1926. 3 abscesses at site of injection of virulent t. b. heavily encapsulated; one 3-mm. focus in adjacent prescapular gland
1164	Controls			Killed, Jan. 16, 1926. Tuberculous tumor at site of virulent injection and adjacent prescapular gland tuberculous
1223				Killed, Jan. 16, 1926. Abscess 6 in. x 3 in. at site of injection. Adjacent prescapular gland tuberculous throughout; posterior cervical, bronchial and mediastinal glands tuberculous; one-forth entire area of lungs tuberculous. 5 tubercles in liver

Group III. Exposure by feeding virulent tubercle bacilli:

Two vaccinated and two control animals (see table IV) exposed by a series of feedings in May, 1925, were tested with tuber-

culin in December, 1925, without reaction. One more vaccinated animal and one control were added to this group and the six cattle were given a series of feedings in April, 1926. Eight months later the six cattle were killed. All showed lesions of tuberculosis confined mostly to the retropharyngeal and mesenteric lymph-glands. As shown in table IV, the tuberculous lesions in the vaccinated animals were slightly more extensive than in the controls.

TABLE IV.—*Exposure by feeding virulent tubercle bacilli*

CATTLE No.	METHOD OF VACCINATION	DATE OF VACCINATION	DATE OF EXPOSURE	RESULT
1203	Intravenous (25 mg. B.C.G.) Revac. intrav. (35 mg. B.C.G.)	Jan. 7, 1925 Jan. 26, 1926	25 feedings on bran, May, 1925 and 14 feedings in mouth, April, 1926	Killed, Dec. 18, 1926. All mesenteric glands tuberculous and both retropharyngeals tuberculous throughout
1200	Subcutaneous (70 mg. B.C.G.) Subcutaneous (100 mg. B.C.G.)	Jan. 26, 1925 Jan. 25, 1926		Killed, Dec. 20, 1926. Right retropharyngeal gland tuberculous. Half of mesenterics tuberculous and one lesion in liver 1.5 cm. diameter
1170	Controls			Killed, Dec. 22, 1926. Right retropharyngeal gland tuberculous. 4 mesenterics tuberculous
1201				Killed, Dec. 22, 1926. Left retropharyngeal and 4 mesenterics tuberculous
1287	Subcutaneous (75 mg. B.C.G.) Subcutaneous (90 mg. B.C.G.)	Aug. 7, 1925 July 22, 1926	14 feedings in mouth, April, 1926	Killed, Dec. 22, 1926. Both retropharyngeal and 2 mesenterics tuberculous
1258	Control			Killed, Dec. 21, 1926. 5 mesenteric glands tuberculous

Group IV. Natural exposure:

Four vaccinated and 4 control cattle (see table V) were placed in an inclosure with 4 tuberculous cattle in May, 1925. By October, one vaccinated and three control animals were dead of parasitism, none showing lesions of tuberculosis on postmortem examination.

In February, 1926, two controls were added to this group and in March another vaccinated animal was added.

In March, 1926, one vaccinated animal and one control of the original group were killed and both showed similar lesions of tuberculosis.

In December, 1926, the remaining three vaccinated and two control animals were killed. One vaccinated and one control animal showed lesions of tuberculosis.

It was unfortunate that three of the original four controls died, as this precluded a direct comparison of the resistance of the two groups. However, of four vaccinated calves which lived through the experiment, two contracted tuberculosis and two remained

TABLE V.—*Natural exposure group*

No.	METHOD OF VACCINATION	DATE OF VACCINATION	DATE OF EXPOSURE	
1215	Intravenous (25 mg. B.C.G.)	Jan. 7, 1925	May 25, 1925	Died, Aug. 21, 1925. Trauma. No lesions of tuberculosis
1185	Intravenous (25 mg. B.C.G.)	Jan. 7, 1925	May 25, 1925	Killed, Mar. 5, 1926. Both retropharyngeal glands tuberculous
1204	Subcutaneous (50 mg. B.C.G.) (100 mg. B.C.G.)	Jan. 7, 1925 Jan. 25, 1926	May 25, 1925	Killed, Dec. 22, 1926. 2 tubercles in left retropharyngeal and one in right
1207	Subcutaneous (50 mg. B.C.G.) (100 mg. B.C.G.)	Jan. 7, 1925 Jan. 25, 1926	May 25, 1925	Killed, Dec. 23, 1926. No lesions of tuberculosis
1293	Subcutaneous (75 mg. B.C.G.) (90 mg. B.C.G.)	Aug. 7, 1925 Aug. 26, 1926	Mar. 26, 1926	Killed, Dec. 23, 1926. No lesion of tuberculosis
1270	Controls			Died, Sept., 1925. Parasitism.
1271				Died, Aug., 1925. Parasitism
1186			May 25, 1925	Killed, Mar. 20, 1926. Both retropharyngeal glands tuberculous
1224				Died, Oct. 27, 1925. Parasitism
1284			Feb. 1,1926	Killed, Dec. 23, 1926. No lesions of tuberculosis
1286				Killed, Dec. 23, 1926. Slight lesions in 4 mesenteric lymph-glands

free. Of three controls which survived, two contracted tuberculosis and one remained free.

As the average exposure of the principals was greater than that of the controls, and the incidence of tuberculosis less, it would indicate that some degree of protection was afforded through vaccination in this group. But the fact remains that 50 per cent of the vaccinated calves contracted tuberculosis during the relatively short period of exposure.

Another group of six calves, born of cattle in the B. C. G. experiment, has been kept in the tuberculous environment since birth, Three were vaccinated subcutaneously during the first ten days of life and three left untreated as controls. The vaccinated animals have been re-vaccinated yearly. No tuberculin test has been made, as it was not desired to do anything which might interfere with the acquired immunity of the vaccinated animals or progress of disease. The object of the experiment is to determine whether it is possible, in a tuberculous environment, to raise calves free from tuberculosis by vaccination with B. C. G. at birth and yearly thereafter, These animals will be killed when they are four or five years old.

The value of oral vaccination in calves is being determined by experiment in collaboration with the Hygienic Laboratory of the Public Health Service. Calves are vaccinated by mouth three times during the first ten days of life and placed in a tuberculous environment, when weaned, with a like number of untreated calves. They are to be removed from exposure one year from date of vaccination, tuberculin tested, killed and autopsied.

Report will be made of these two last mentioned groups at a later date.

Summary and Conclusions

B. C. G. was shown to be a mammalian tubercle bacillus of very low virulence, if not avirulent. A tuberculin comparable in potency to a standard tuberculin was prepared from the growth on liquid medium. Guinea pigs inoculated intraperitoneally with B. C. G. manifest a marked sensitization to mammalian tuberculin.

Immunization experiments in guinea pigs showed a marked prolongation of life in animals treated with B. C. G. over untreated animals, when both groups were subjected to tuberculous exposure. Vaccination did not result in immunity, however, as every vaccinated animal died eventually of tuberculosis.

Cattle vaccinated with B. C. G., with an equal number of controls, were exposed to tubercle bacilli by intravenous injection, subcutaneous injection, feeding, and contact with known tuberculous animals. In the group where exposure was made by feeding virulent tubercle bacilli, the vaccinated cattle showed more extensive lesions, as a whole, than the unvaccinated. In the three other groups, resistance to the localization and generalization of tuberculosis was slightly more manifest in the vaccinated than in the unvaccinated animals, but in no group was there manifest an immunity as measured by the prevention of infection. Thus, vaccination with B. C. G. does not appear to prevent virulent tubercle bacilli from entering the body and establishing foci of infection, but merely inhibits the extension of tuberculous processes.

The above results clearly indicate that vaccination of cattle with B. C. G. has no value as a means of eradicating tuberculosis in live stock.

Tick Law Violators Sentenced

For interfering with tick eradication near Pascagoula, Miss., J. W. Hamilton and Salbery Delmas were sentenced by Federal Judge Robert T. Ervin, in the U. S. District Court, at Mobile, Ala., to serve six months in the Mobile County jail. Last March an agent of the U. S. Department of Agriculture observed a herd of about 24 cattle stray from territory near Pascagoula, Miss., into the vicinity of Grand Bay, Ala. Finding the cattle to be tick-infested, the agent drove the herd onto property belonging to W. C. Bullock, where the cattle were dipped. The agent instructed Mr. Bullock to quarantine the cattle on his premises and permit no one to take them until further notice.

A few days later, about midnight, according to the testimony, three men broke the lock of the gate and proceeded to drive out the cattle. On rising and going to the window, Mr. Bullock was confronted with a shotgun held by one of the trio and told to remain in the house or he would be killed. After driving the cattle a short distance from the premises, the man with the gun fired it, shots falling on the house. Aided by the moonlight, Mr. Bullock recognized one of the men as John W. Hamilton. Later, Salbery Delmas was identified as being another of the three men who participated in driving the quarantined herd from the premises. The jury which heard the case returned a verdict of guilty within a few minutes after hearing the evidence.

CLINICAL AND CASE REPORTS

(Practitioners and others are invited to contribute to this department reports of unusual and interesting cases which may be helpful to others in the profession.)

POULTRY FEEDS A FACTOR IN THE DISSEMINATION OF POULTRY DISEASES

By MICHAEL D. DUCEY, *Merrill, Mich.*

In a community that the writer has had under observation for the past few years, the poultry industry has developed into great proportions. Flocks numbering from several hundred to several thousand birds are now becoming common. Most of the owners are doing well with their flocks. New poultry-houses are being built each year, anticipating larger operations along these lines.

About the middle of November, 1928, chicken pox broke out in one flock in the community and within the course of a few weeks the condition appeared to be general in the locality. It had spread and made its appearance in flocks a distance of six or seven miles from the primary outbreak.

The condition reached a stage where it appeared to the flock-owners that the disease was going to disrupt the industry and some measures would have to be taken to prevent the spread of the disease. A meeting of those interested was held and chicken pox vaccine was obtained. The flock-owners administered the vaccine to both infected and non-infected flocks. Although this procedure did not prevent the spread of the disease, it did seem in some instances to lessen the severity of the condition.

In the community under discussion there is a feed-mill that grinds, mixes and blends feeds for farmers. Such mills are quite common in almost every community nowadays. Besides doing the grinding and blending, the mill furnishes the supplements that enter into the feed in addition to the grains supplied by the farmer.

The primary outbreak in this community started in a flock within one-half mile of this mill. It was the custom on this farm to take the empty feed-bags back to the mill to be refilled when empty. As several tons of egg mash, scratch feed and so forth were used on this farm each week, it resulted in quite a large traffic in bags back and forth. Often these bags were badly

contaminated with fecal matter and discharges from the diseased birds and from being stored in poultry-houses, granaries, feed-rooms and so forth, where the afflicted birds were often allowed to pass their last days or even weeks, as the case might be, previous to their demise.

Often the grain was exposed to infection on account of this practice. Just why this condition should prevail on so many farms is difficult to account for, unless it is on account of the belief of the owners of the afflicted birds, that their being in the presence of an abundance of food will encourage them to eat and make a hasty recovery.

When these dirty, contaminated and infected bags are filled with grain, to be delivered to the mill for the purpose of preparing feed, it often becomes necessary for the good appearance of the bags to turn them inside out, making a bad matter worse. On reaching the mill, the infected grain is dumped into the receiving-pit and much of the infected material on the bags is vigorously shaken off into the pit. From the pit the grain goes to the weighing-hopper to be weighed, and from this point it goes to the mixer, where meat scraps, bran middlings and other ingredients are added.

From the mixer it goes to the grinder and then to the bagger and back into the same old bags, ready for use. In case the mill is not equipped with a mixer, the process is carried out on the floor, where the mixing is done with shovels. Even though a patron brings in grain free from infective material, it is easy tor it to become contaminated in the process of milling, from the infective materials that have preceded it.

It occurs to the writer that poultry feed prepared under the conditions mentioned would carry a considerable amount of infective material with it at all times, and would carry every kind of infection to which poultry is heir.

When we take into consideration that one of these local mills serves anywhere from a half-dozen customers to as many as one hundred a day, the condition becomes a matter of serious concern, in the matter of poultry disease control. Unless measures are taken to correct the existing condition, poultry farming is going to be less profitable in the future, than it has been in the past.

The reason for using this outbreak of chicken pox in this article was because of its spontaneous nature and because it traveled so far in such a short period of time, clearly indicating food con-

tamination. In this article the writer has tried to point out how easily poultry diesases can be disseminated through the careless preparation and handling of feeds.

HEAT AS A THERAPEUTIC AGENT IN THE TREATMENT OF DEMODECTIC MANGE

By JOSEPH W. VANSANT, *Fox Chase, Pa.*

About the middle of December, 1928, my wife drew my attention to our little five-months-old Boston pup. She had a skin eruption over the left eye about the size of a small hazel-nut. Just as many do when anything is wrong with their own animals, I made a very superficial examination of the affected part and told my wife to use iodex, rubbed in well, once or twice daily. On December 28, I was reminded that the trouble was spreading quite a little and that the hair was coming off. Upon examining speciments under the microscope, we found a number of *Demodex folliculorum*.

This puppy is a great, great granddaughter of a Boston we lost of senility last year and the only blood-line of our old dog that we have left. We thought so much of the old dog and this pup seems to have so many of her ways, that in this case I was not only going to lose a client but my happy home as well, if I did not cure her. As I thought over the case, it did seem that a man who had spent years in college and had over twenty-five years of experience in practice, ought to be able so combat these little parasites just beneath the outer layers of the skin. I had used, on a skin infection of my feet, that had caused intense itching, a solution of resorscin and salicylic acid, one dram of each in one ounce of alcohol.

This gave me almost immediate relief, so I gave my wife a bottle of the mixture and told her to use it on the pup, twice a day. Some time before that I had talked with Dr. M. J. Harkins, of the School of Graduate Medicine, University of Pennsylvania, about Demodex and he said that heat had been found quite effective in killing this parasite. I had tried using a tub of hot water on another case but this did not seem to work out, especially where the infection is around the head.

We have a Thermolite (James & Co.) in the house so we thought we would try it. This was used twice a day, from five to ten minutes on the affected part. It was not objected to by the dog

unless it became too hot. Then it was thrown off for just a second and then back again.

This treatment was started about January 1, 1929. A few days later another small spot appeared over the right eye. Demodex was found and the same treatment applied. We looked for and found parasites every couple of days until the seventh or eighth day. Then I found what appeared to be broken down or partly decomposed parasites but have not found any since.

About January 9, a part setter was brought to my office with a sore spot on the top of her head. On examination we found Demodex. As we were still using the Thermolite on our own pup, I gave this client a bottle of the mixture before mentioned. On January 12, we stopped using the light and loaned it to the owner of the setter. This was used twice daily, just as we had used it, and on January 23, several examinations were made but not a single parasite was found and the wound looked very well.

The hair is nearly grown out on the little Boston's face at this time. The spot over the right eye is entirely covered over and I have no fear of a return of the disease.

I believe that the main part of the treatment is the heat, as near as I can tell. The temperature reached 120 to 130 degrees Fahrenheit. It certainly would seem that this treatment would be 100 per cent efficient in those cases which are caught when the disease is just starting, or even in bad cases if it would be possible to take the time to treat all affected parts. We may even fix up an electric heat-bath, such as is often given the human.

(Since this report was prepared, Dr. Vansant has treated another case with equally satisfactory results.—EDITOR.)

KAMALA, AN ANTHELMINTIC FOR REMOVAL OF TAPEWORMS IN BEARS*

By TEUNIS VERGEER, *Ann Arbor, Mich.*

In the course of my investigations on *Diphyllobothrium latum*, the broad tapeworm of man, two bears[1] were experimentally infested with this parasite. Since captive bears are too valuable to kill in order to secure their parasites, it was decided to try to

*Contribution from the Zoological Laboratory of the University of Michigan. One of a series of investigations carried on under grants 96 and 131, of the Committee on Scientific Research, of the American Medical Association, awarded to Profs. George R. La Rue and A. S. Warthin, of the University of Michigan, under the former of whom the work has been conducted and to whom the author here expresses his grateful appreciation.

Received for publication, February 7, 1929.

recover the tapeworms by the use of an anthelmintic. The advice of two of the foremost authorities on anthelmintics was asked and I was informed that very little was known concerning anthelmintic treatment for bears. Arecolin hydrobromid, areca nut, aspidium, and kamala were recommended, in the order named.

In determining the choice of anthelmintic for bears and other wild animals, one needs to consider the effect of the treatment on the host, the effect on the parasite, and the ease of administration. Arecolin hydrobromid and areca nut are highly toxic and, since their effect on bears is unknown, it would be necessary first to try too small doses to determine the margin of safety; their bitter taste makes them difficult to administer, even in capsules, and the necessary purgatives are also difficult to give to bears.

Aspidium, or male fern, is considered to be one of the most effective drugs against tapeworm, but is not always effective. Its unpleasant taste requires that it be given in a capsule and because of its toxic effect the use of purgatives is desirable. Since bears habitually taste and chew everything thoroughly before swallowing, the administration of capsules to bears would require force.

Kamala, however, has purgative, as well as anthelmintic, action and is tasteless. It is, therefore, easily administered to bears. According to Chopra and Chandler,[2] in ordinary doses kamala produces no toxic effects; it is not absorbed; it does not affect the heart, the central nervous system, or respiration. It is such a mild drug that its use is indicated for children and debilitated individuals for whom male fern is not advisable. Dogs may be given ½ to 2-dram doses repeated in eight hours.[2]

Generally food has not been withheld before treatment and the kamala has often been adulterated with red brick powder and ferric oxid. The results obtained by this method of administration and the adulterations may have been responsible for its removal from the official British and United States pharmacopoeias, in the latter of which it appears last in 1894. I decided to try kamala first, since its purgative action would eliminate the difficult task of administering a purgative to the bears. Moreover, since it has the mildest action on the host, other treatment could be given shortly afterward in case of failure to remove the tapeworms.

Kamala being tasteless, it was decided to take advantage of the excessive fondness of bears for honey by using it as a vehicle for the kamala. The bears were last fed about forty-one hours before treatment. They weighed 100 to 125 pounds each, and I decided to give each of them two drams of kamala, the maximum dose for dogs, made into a paste with honey. Before feeding the mixture I tasted it and found it nearly as good as pure honey. It was relished by the bears and the only difficulty in administering it arose from the desire of the first bear to get the second dose also.

Five hours after the administration of the kamala the bears were given one quart of milk each. Two hours later they began to pass tapeworms. During the next five hours a total of more than 120 feet of *D. latum* was passed and eight anterior ends were found. The bears were in a cage with a cement floor and the worms had to be picked up from this floor. Some tapeworms were nearly complete and some were badly broken by the bears which were active during this time. The worms gave no sign of life. No scolices were attached to the strobilae, but in mucus picked up accidentally with the worms one dead scolex was found. Other scolices may have been passed in a similar manner but overlooked.

From the small dose of kamala used, the quantity of tapeworms passed and the dead scolex found, it seems safe to conclude that kamala is an effective anthelmintic for the removal of tapeworms in bears. I considered the treatment so effective that the second dose was not given. The bears were rather restless during the day of treatment but drank their milk, ate a meal in the evening, and were playful the next morning.

No tapeworm eggs were present in the feces thirteen days after treatment, when the bears were disposed of.

The above experiments indicate that if food is withheld for some time previous to treatment, kamala is a good tasteless anthelmintic for the removal of tapeworms from bears; it lacks undesirable poisonous and dangerous qualities and is self-sufficient in purgative action. Anthelmintic treatment with kamala is most simple and easy, and because it saves labor, it is also the most economical treatment.

Additional reports on the use of kamala as an anthelmintic for treatment of tapeworms in wild animals are highly desirable.

REFERENCES

[1]Vergee,r Teunis: Dissemination of the broad tapeworm by wild carnivora. Jour. Can. Med. Asso., xix (1928), pp. 692-694.

[2]Chopra, R. H. and Chandler, Asa C.: Anthelmintics and Their Uses. (Baltimore, Williams and Wilkins Co., 1928), pp. 93-95.

STREPTOTRICHOSIS CANUM—PSEUDOACTINOMYCOSIS OF A DOG*

By GERRY B. SCHNELLE, *Boston, Mass.*

Angell Memorial Hospital

The subject was a male pointer, whelped in 1922. When purchased by the owner it was one year old. During its entire existence the dog had recurrent periods in which it would become emaciated and ravenously hungry, no amount of milk and raw meat sufficing its craving. In the winter of 1927-28, it attained very good condition and the following summer became noticeably sleepy and lazy and started to lose flesh.

In September, the dog was treated for an apparently acute digestive disturbance from which it at least partialty recovered. Several weeks later the owner brought the animal to the hospial for observation. At that time it had a temperature of 106°F., diarrhea, marked rigidity of the abdomen, with pain over the diaphragm and chest and somewhat increased respirations. During a six-weeks period of observation the digestive symptoms decreased and the respiratory symptoms increased, gradually developing pleuritic symptoms. It drank a quart of milk and ate two eggs, one and one-half pounds of meat and six drams of cod-liver oil with metagen, daily. Digestion was good but the dog continued to lose weight rapidly.

Two abscesses appeared one morning, one over the last rib and the other under the skin just anterior to the bulbocavernosus, possibly originating in the pelvic peritoneum. Both were lanced and bealed naturally and quickly. At the end of the six-weeks period, the dog was so emaciated and the pleuritic symptoms so pronounced that it was destroyed.

Postmortem revealed fully a quart of reddish-gray, cloudy exudate in both thoracic cavities, granulations on the pleura, which, when floated in water, were fully two inches long, and broncho-pneumonia with consolidated areas and numerous grayish-yellow nodules scattered throughout. Microscopical examination revealed the *Streptothrix canis* or *Actinomyces canis.*

Looking backwards at this case, the respiratory symptoms with increasing emaciation in spite of the ravenous appetite should be salient points in diagnosis. Hutyra and Marek quote cases without the pain apparent in this pointer. Just how long the fungus

*Presented before the Massachusetts Veterinary Association, Boston, February 13, 1929.

had been growing I have no idea and would appreciate information on similar cases.

Dr. S. B. Wolbach, of the Harvard Medical School, assisted in the identification of the fungus.

PREPOTENCY

Now Hiram had a cow dog,
That brought them home at night;
She even drove them in their yoke
And placed each cow just right.

She thought it was her duty
For he kept her "tummy" full.
But the fly within the ointment was
She wouldn't bring the bull.

This set old Hiram thinking, that
Perhaps the collie knew
That she was but a cow dog and
That made the bull "taboo."

So he sent and got a bull dog.
This fixed things just sublime.
She brought the *cows* at evening
And—*he* brought the *bull* on time.

Now in the course of nature,
Five tiny barks and squeaks
Announced she had a family
And she couldn't work for weeks.

When Hiram knew, they say his face
Was wreathed in smiles right quick.
A cow dog ma, a bull dog pa?
One pup will do the trick.

M. L. PLUMER.

Remember when Abraham Lincoln was elected president and the people drove oxen to the polls to vote?

—*Des Moines Register.*

ABSTRACTS

VERSUCHE ZUR DISINFEKTION BEI MAUL UND KLAUENSEUCHE MIT SCHWEFLIGER SÄURE SOWIE MIT NATRONLAUGE (Disinfection Experiments in Foot-and-Mouth Disease with "Schwefliger Saure" (SO_2 preparation), as well as Sodium Hydrate). K. Trautwein and K. Reppin. Arch. f. Wiss. Prakt. Tier., lviii (1928), 1, p. 95.

In this abstract attention is given to the part that deals with experimental work with sodium hydrate, undertaken to confirm the work of the American Foot-and-Mouth Disease Commission. The authors found that one per cent sodium hydrate solution destroyed the virus of foot-and-mouth disease (types A, B and C) in lymph from vesicles of swine in one minute.

In coverings of foot-and-mouth disease vesicles from lesions in guinea pigs, swine and cattle, the virus was killed in from one to fifteen minutes but when these coverings were mixed with sand, the time required to destroy the three types of virus ranged from thirty to sixty minutes.

As sodium hydrate solution is colorless and since it is advantageous for a disinfectant to be colored so that the thoroughness of its application can be controlled, the authors tested the efficacy of a combination 1 per cent sodium hydrate and 5 per cent calcium hydrate solution as a virucidal agent in a manner similar to that previously described for sodium hydrate. This combination appeared to be about as effective as sodium hydrate alone.

Sodium carbonate (which the American Foot-and-Mouth Disease Commission, in limited tests, found to be ineffective against the virus of foot-and-mouth disease) was found by the authors to have very little destructive action against foot-and-mouth disease virus.

One per cent sodium hydrate solution was found to be harmless for animals and man when applied liberally to the skin. Sixty-one cattle and twelve hogs were thoroughly sprayed with the solution; liberal amounts were applied to the head so that the solution would surely reach the eyes. The animals were unaffected. In addition, the sodium hydrate solution was placed in the conjunctival sac of three cattle and one hog without harmful effect.

The face and hands of persons spraying the cattle were exposed to the solution, but no ill effects were noted.

After weeks of contact with 1 per cent sodium hydrate solution, iron, lead, copper and brass remained unaffected. Leather also was unaffected. In colored fabrics treated with the solution the colors had a tendency to "run."

The authors conclude as follows:

> These experiments therefore have confirmed the findings of the Americans on the good virulicidal properties of sodium hydrate against foot-and-mouth disease virus. For practical disinfection 1 per cent sodium hydrate stands as an excellent agent, as it works equally as well as the 5 per cent sulfoliquid and the recently investigated SO_2 powder preparation and in part surpasses them. In consideration of its reliable action, its cheapness, its odorlessness, harmlessness, and the possibility of its use in combination with a weak lime solution, 1 per cent sodium hydrate appears to be especially suitable for disinfection in foot-and-mouth disease.

DIE BEKAMPFUNG DES MAUL UND KLAUENSEUCHE DURCH RINGIMPFUNGEN. Erhardt. Munchen. Tierarzt. Wochenschr., (1928) 36.

According to the author, 1 per cent sodium hydrate and a combination of 1 per cent sodium hydrate and 5 per cent calcium hydrate are prescribed as the official disinfecting agents used in combating an extensive outbreak of foot-and-mouth disease in Bavaria, in the spring of 1928.

Note:

The United States Department of Agriculture Foot-and-Mouth Disease Commission reports* that a 1 per cent and 2 per cent solution of sodium hydrate possesses highly virucidal properties against the virus of foot-and-mouth disease.

H. W. S.

Salaries Raised

City officials of Baltimore, Maryland, recently announced a higher schedule of salaries in connection with the position of municipal meat inspector. The new schedule provides that veterinarians on the meat inspection force will receive $2300 during their first year; $2400 the second year; and $2500 from the third year on. It is reported that the increase in the salary scale for municipal veterinary inspectors was prompted by the difficulty that the city officials have experienced in securing veterinarians for these positions, the salaries having been too low to attract qualified men.

*Summary of Observations of the Commission to Study Foot-and-Mouth Disease, by Peter K. Olitsky, published in the Jour. A. V. M. A., lxx (1927), n. s. 23 (6), pp. 926-934. Report of the Foot-and-Mouth-Disease Commission of the United States Department of Agriculture, by Peter K. Olitsky, Jacob Traum and Harry W. Schoening. U. S. Dept. of Agr. Technical Bulletin No. 76 (1928).

ARMY VETERINARY SERVICE

CHANGES RELATIVE TO VETERINARY OFFICERS

Regular Army

Captain Samuel G. Kielsmeier, V. C., has been ordered to temporary duty at Fort Oglethorpe, Ga., for a period not to exceed five months, effective on or about February 1, for the purpose of relieving Colonel Vans Agnew, now on leave of absence awaiting retirement.

Captain Max Siereveld has reported his arrival at Fort Mason, Calif., February 9, from foreign service in the Philippine Department.

Reserve Corps

Shown below is a list of the Veterinary Reserve Officers, according to rank:

Colonels	1
Lt. Colonels	19
Majors	81
Captains	300
1st Lieutenants	209
2nd Lieutenants	420
Total	1030

New Acceptances

Arundel, Hugh Francis J...2nd Lieut..120 S. Zetterower Ave., Statesboro, Ga.
Drayer, Joseph H.....Captain...44 West Longview Ave., Columbus, O.
Odou, William Desere.....Captain...Hettinger, N. D.

Poster on Scabies Issued

To aid in the suppression of the serious contagious disease variously known as scabies, scab and mange, the Bureau of Animal Industry, U. S. Department of Agriculture, has issued a poster on the subject. Enlarged illustrations of scab mites show the various forms which attack sheep, swine and horses. The poster shows also a typical advanced case of a scabby sheep and likewise a calf affected with scabies.

Urging stock-owners to isolate and report suspected cases to the nearest veterinarian, the poster explains that the disease can be eradicated by dipping in lime-sulphur or nicotin solution. At least two dippings, ten to twelve days apart, of all infected and exposed animals, are necessary for a cure. Though the interstate movement of live stock affected with scabies is prohibited by federal laws, there is still an opportunity for stock-owners to co-operate with veterinary officials in suppressing local outbreaks promptly.

Copies of the poster may be obtained upon request by persons interested in furthering the suppression of the disease. Write to the U. S. Department of Agriculture, Washington, D. C.

MISCELLANEOUS

VETERINARY BUILDING AT MISSOURI FAIR CREATES INTEREST

The officers of the Missouri Veterinary Medical Association are receiving numerous inquiries from veterinarians in other states relative to the veterinary building erected last year on the Missouri State Fair Grounds at Sedalia (see the JOURNAL for December, 1928, pp. 110-111).

The accompanying illustration will give some idea of the appearance of the building which is located west of the University Building and is regarded as one of the most attractive of the medium-size buildings on the grounds. It was dedicated with appropriate ceremonies, during the week of the 1928 Fair.

VETERINARY BUILDING
Missouri State Fair Grounds, Sedalia

Upon entering, visitors find themselves in a spacious lobby. On the left side is a modern and thoroughly equipped rest-room for the ladies. On the right side of the lobby are the offices of Jewell Mayes, of Jefferson City, secretary of the Missouri State Board of Agriculture and director of this department at the State Fair, and Dr. Homer A. Wilson, of Jefferson City, state veterinarian of Missouri and department superintendent.

The auditorium will accommodate about 300 persons and it is here that visitors will have an opportunity to learn the finer parts of the department's work. During the week of the Fair, the auditorium will be converted into a small theater. Motion pictures, featuring the service rendered by Missouri veterinarians in coping with bovine tuberculosis, hog cholera, fowl cholera, avian tuberculosis, as well as modern methods of diagnosis and eradication of animal diseases, are to be shown.

UNFOUNDED RUMORS CONCERNING FOOT-AND-MOUTH DISEASE

Although the U. S. Department of Agriculture has furnished the public with the essential facts concerning the recent outbreak of foot-and-mouth disease in California and has freely furnished other information on request, several unfounded rumors concerning the outbreak have gained considerable circulation. The persistent report that a ship of the United States Navy brought the infection to the United States is entirely without foundation. In order to clear the U. S. Navy of all responsibility for the recent outbreak and to correct other misinformation, Dr. John R. Mohler, Chief of the Bureau of Animal Industry, U. S. Department of Agriculture, recently made the following statement:

> The investigation of the source of the outbreak has been completed. The garbage which caused this outbreak was not taken from a vessel of the United States Navy, but the S. S. Los Angeles, which plies chiefly between California and Hawaii. However, last fall, this vessel left for a South American cruise. During this trip it was provisioned at a South American port, where it took on 18,000 pounds of fresh beef, pork, lamb and veal. In December the vessel returned to San Pedro, Calif., and what remained of the meat obtained in South America was transferred to another ship, when the S. S. Los Angeles was prepared to go to dry dock. Portions of the meat, discarded during the transfer, finally reached the hog ranch where foot-and-mouth disease made its first appearance in the recent outbreak. The evidence in the case has been referred to the legal authorities of the department for the prosecution of the offenders.

Dr. Mohler stated that there is absolutely no reason to believe that there has been any laxity on naval vessels in carrying out an order of the Secretary of the Navy, issued September 10, 1924. This order directs the manner in which garbage from naval vessels shall be disposed of and was issued on Dr. Mohler's recommendation, after a personal conference with the Commandant at the Mare Island Navy Yard, near San Francisco. The order provides, briefly, that garbage from ships making port from any part of the world where foot-and-mouth disease exists must be placed in barrels especially marked with a broad red band and

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that all such garbage must be burned, as long as food from restricted ports remains on board. Commanding officers of ships have been ordered to take measures to prevent conveyance to shore of fresh food products in any form. Moreover, no ruminants or swine of any kind that may have been taken on board from any place outside of the United States are permitted to land.

In regard to garbage originating on vessels other than naval vessels, a government regulation designated as B. A. I. Order 298 was issued by authority of the Act of February 2, 1903, to prevent the importation into this country of communicable diseases of live stock. The order prohibits the importation of all fresh or frozen beef, veal, mutton, lamb and pork, from regions where foot-and-mouth disease or rinderpest exists, whether it be in quarters, smaller cuts or trimmings.

A subsequent regulation, known at B. A. I. Order 301, together with amendments, places still further restrictions on importations of live stock, meats, hides, hair, wool, hay, straw, forage, viruses, serums and various other products relating directly or indirectly to live stock. Research work also has been conducted in recent years to determine the most effective means of sterilizing bulky products, especially those compressed into bales. As a consequence, improvements in methods have been put into effect.

In the enforcement of these federal laws and regulations, Dr. Mohler said, every effort is made to prevent violations and it is probable that such laws are violated much less frequently than the various general laws, such as the ones against murder and theft. In addition, the Bureau of Animal Industry has requested live stock sanitary authorities of coastal states, as well as health officers of the various port cities, to cooperate by taking appropriate action in matters coming within the authority of those officials. The danger of foot-and-mouth disease infection from garbage has been long recognized by veterinary officials and recommendations have been made on the subject to local officials.

The latest official information available, relative to the recent outbreak of foot-and-mouth disease in California, is to the effect that the infection appears to have been completely eradicated. An official order of the U. S. Department of Agriculture, effective March 18, removed the quarantine placed on the limited affected area in California.

The outbreak was the shortest in duration, and involved the smallest number of premises, of any of the several outbreaks that have occurred in this country. It also caused the least interfer-

ence with agriculture and industry in the territory involved. As a purely precautionary measure, the premises on which the disease appeared are being held under strict veterinary supervision, pending the termination of the usual tests. An adequate force of trained veterinarians will be kept in the locality to deal promptly with any recrudescence, should the same occur. Past experience has shown the wisdom of this safeguard.

FOR MEN ONLY. STOP! LOOK! LISTEN! ACT!

The ladies of the Auxiliary to the American Veterinary Medical Association are wondering if the gentlemen of the A. V. M. A. know of the work the members of the Auxiliary are not only trying to do, but *are doing.*

If you are vitally interested in any department of the veterinary profession, are you interested in helping young men who have had the misfortune of not being able to finance their college education?

We have helped eleven young men through accredited veterinary colleges since 1922, and each of them has made good and reimbursed the Auxiliary, and today each is an honor to the profession.

Your mother, sister, wife or daughter can be a member of the organization, and help this worthy cause by paying a small initiation fee of 50 cents and $1.00 per year dues.

Would you consider it a kind deed for a group of women to help your son through college if he was not financially able to help himself? Will you not speak to your home folks and insist on their joining the Women's Auxiliary to the A. V. M. A.?

Help us to help others.

Due to the untiring efforts of the past officers, our organization has been quite a success, but in the future, we hope to be more progressive, as a result of our increased membership, and by each old member bringing in a new one, we will attain the goal.

Anyone wishing to join the Auxiliary can send her name, full address and check to Mrs. S. E. Hershey, Secretary, 1109 Washington St., Charleston, W. Va.

S. E. C.

A certain man left his wife money to pay for a stone to his memory. She carried out the letter of the bequest by buying a diamond.

—*Pathfinder.*

ASSOCIATION MEETINGS

KANSAS CITY ASSOCIATION OF VETERINARIANS

The regular monthly meeting of the Kansas City Association of Veterinarians was held at the Baltimore Hotel, Kansas City, December 19, 1928, and the following officers were elected for the ensuing year: President, Dr. F. H. Suits, Odessa, Mo.; vice-president, Dr. H. R. Thompson, Kansas City, Mo.; secretary-treasurer, Dr. J. D. Ray, Kansas City, Mo.

At this meeting the members enjoyed one of the best programs pertaining to hog practice that has ever been furnished in this territory.

No meeting was held during the month of January on account of the date conflicting with the special course for graduate veterinarians held at the University of Missouri.

The February meeting was held at the Ivanhoe Masonic Club on February 12 and was in the form of a dinner. Thirty-five veterinarians and members of their families attended. The new officers were installed and the social get-together followed. The Agricultural Extension Agent of Jackson County was the guest speaker of the evening and he made a most forceful talk on professional ethics. We are glad to announce that our Extension Agent is a friend of the veterinarian.

The date for the regular monthly meeting of the Association has been changed to the second Tuesday evening in each month. Any veterinarian visiting in and around Kansas City at that time is always welcome at these meetings.

J. D. RAY, *Secretary.*

MAINE VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Maine Veterinary Medical Association was held at the State House, Augusta, Wednesday, January 9, 1929.

Mr. C. P. Osgood, State Dairy Inspector, gave a talk on dairy inspection and pending legislation with regard to contagious abortion.

The following officers were elected for the ensuing year: President, Dr. M. E. Maddocks, Augusta; vice-president, Dr. P. R. Baird, Waterville; secretary-treasurer, Dr. C. F. French, Rockland.

It was decided to hold the next quarterly meeting at the Congress Square Hotel, Portland, Maine, on Wednesday, April 10, 1929.

C. F. FRENCH, *Secretary.*

OHIO STATE VETERINARY MEDICAL ASSOCIATION

The forty-sixth annual meeting of the Ohio State Veterinary Medical Association was held January 9-10, 1929, at the Deshler-Wallick Hotel, Columbus. Dr. D. M. Swinehart presided at the sessions.

About 175 were in attendance during the meeting. This was somewhat smaller than in previous years, which, probably, was a direct result of the influenza epidemic, raging at the time.

The reports of the various standing committees were given on schedule and were very interesting and instructive. A very interesting report was given by the Committee on Publicity, of which Dr. F. A. Zimmer was Chairman. This committee made an earnest effort to keep the name of the profession before the public and to instruct the public as to the capacities of the modern veterinarian.

Those who appeared on the program with special subjects were as follows: Dr. T. E. Munce, president of the American Veterinary Medical Association, who gave a very interesting discussion on the policies and plans of the national association; Dr. Walter M. Simpson, Director of the Miami Valley Hospital, Dayton, Ohio, who presented the subject, "Tularemia," in a manner which excited much comment; Dr. Edward Lodholz, from the Graduate School of Medicine, University of Pennsylvania, who gave a very interesting paper on "Femininity in Our Domestic Animals"; Dr. R. E. Lubbehusen, from the Department of Agriculture of Pennsylvania, who addressed the Association on "Some Important Poultry Disease Control Problems"; Dr. N. S. Craver, Youngstown, Ohio, on "Canine Obstetrics"; Dr. E. V. Hover, Lima, Ohio, on "Anesthesia in Veterinary Practice with Special Reference to Spinal Anesthesia"; Dr. J. W. Benner, Ohio State University, on "Failures and Successes in Vaccinating Young Pigs Against Hog Cholera"; Dr. W. F. Ludwig, Barnesville, Ohio, on "Diseases of the Udder"; and Dr. F. A. Zimmer, State Veterinarian of Ohio, on "What Veterinary Policies Should Be."

The Association appropriated funds for the employment of legal counsel to carry on the fight against the "quacks." It also

decided to have the President appoint a committee to consider the advisability of affiliating with the American Veterinary Medical Association.

The banquet and dance, held the evening of the first day, was supplemented with "An Hour of Magic," by Mr. W. W. Durbin, accomplished magician, of Kenton, Ohio. About 175 persons attended this evening's entertainment, of whom about 65 were the wives and sweethearts of the members. These ladies were also entertained by the Association at a theater party and a complimentary luncheon, followed by a program of art.

The officers elected for the ensuing year are: Dr. Frank L. Carr, Alliance, Ohio, president; Dr. H. A. Hoopes, LaRue, Ohio, vice-president; Dr. R. E. Rebrassier, Columbus, secretary: Dr. D. C. Hyde, Columbus, treasurer. Drs. E. V. Hover, Lima; E. W. Roberts, Columbus; and H. S. Salt, New Philadelphia, were elected as members of the Executive Committee.

R. E. REBRASSIER, *Secretary.*

UNIVERSITY OF PENNSYLVANIA VETERINARY CONFERENCE

The University of Pennsylvania annual conference of veterinarians was held on January 9 and 10, 1929. The meeting was well attended and many favorable comments on the high character of the papers were heard. Each conference seems to be an improvement on the one held the previous year. It is hoped this record can be maintained indefinitely.

The meeting started at 2 p. m., with a splendid paper on "Internal Parasites in Sheep and Swine," by Dr. Benjamin Schwartz, of the U. S. Bureau of Animal Industry. This subject is of growing interest to practitioners and Dr. Schwartz held the close attention of every man present. This was followed by a discussion and demonstration of "The Medication of Sheep and Swine," by Dr. Henry W. Turner, of the Pennsylvania Bureau of Animal Industry. Dr. Turner has given this subject special study for several years and his demonstration and remarks were very helpful to the men who were fortunate enough to be present.

In the evening we had an exceptionally good meeting. "Remarks on Ocular Therapeutics," by Dr. G. E. de Schweinitz, of the Graduate School of Medicine, University of Pennsylvania, who has an international reputation as an ophthalmologist of high standing, was the first address. Needless to say, this paper added

considerably to the success of the conference. The next address was also very interesting, and was presented by a practitioner who has done a great deal of original work of an experimental nature on the subject. The title of the address was "Notes on Ductless Gland Therapy, by Dr. Edward R. Blamey, New York City, who has a large small-animal practice in that city.

On Thursday morning Dr. H. E. Bemis, of the University of Pennsylvania School of Veterinary Medicine, ably discussed the subject of "The Care and Treatment of the Feet of Cattle." The discussion brought out many points of practical and scientific value to every man who has any cattle practice. This discussion in itself was worth all it cost to attend the meeting. Dr. F. R. Beaudette, of the New Jersey Experiment Station, addressed the meeting on "Poultry Diseases Important in Practice." Dr. Beaudette handled this subject to the satisfaction of all and, no doubt, stimulated the interest of the men present in this subject. Dr. Robert O. Biltz, of the Pennsylvania Bureau of Animal Industry, was next on the program with demonstrations in poultry disease work. He had a crate of tuberculous chickens, on which he demonstrated methods of dosing and postmortem technic. An interesting discussion on poultry disease control followed, which was very well handled by Dr. Biltz.

In the afternoon Dr. W. J. Lentz, of the Veterinary School, read a paper which had been prepared by Dr. Hugh F. Dailey, of the Angell Memorial Hospital, Boston, Mass. Dr. Dailey was unable to be present personally, owing to the illness of his assistant. The title of the paper was "How to Handle Distemper in Dogs." The paper contained many good ideas which were based on Dr. Dailey's extensive experience in treating this disease.

Dr. Reuben Hilty, of Toledo, Ohio, was unable to be present, owing to illness. This was deeply regretted but it is hoped that we may have him with us next year.

The balance of the afternoon was devoted to demonstrations of foot operations in cattle by Dr. H. E. Bemis. This was a splendid climax to one of the best conferences we have held.

G. A. Dick, *Reporter.*

OKLAHOMA STATE VETERINARY MEDICAL ASSOCIATION

The Oklahoma State Veterinary Medical Association held a very interesting and successful meeting at the Huckins Hotel,

Oklahoma City, January 14 and 15, 1929, Dr. George Pugh, of Lawton, presiding.

The program consisted of papers and discussions on the subjects of "Abortion Disease in Cattle," by Dr. A. T. Kinsley; "Diagnosis and Treatment of Poultry Diseases," by Dr. O. E. Robinson, Bixby; "Poultry Management," by Prof. Robert Penquite, of the Oklahoma A. and M. College, and "Pulmonary Edema," by Dr. J. H. Wirtz. Dr. N. F. Williams, State Veterinarian of Texas, gave a detailed outline of the official plan of controlling and eradicating contagious abortion now in operation in the state of Texas, which provoked a lively discussion, pro and con.

Members of both houses of the Oklahoma State Legislature were special guests of the Association at the banquet, which was given on the evening of the 14th, when Dr. J. E. Gibson, of Indianapolis, Indiana, made a splendid talk on tuberculosis eradication in general, with special emphasis on the importance of early action to this end by the southwestern states. Dr. Gibson stressed the economy of eradicating tuberculosis in Oklahoma and other southwestern states, while the extent of infection is still very small as compared with some of the less fortunate northern and eastern states. That the visiting members of the Legislature were impressed with Dr. Gibson's masterful presentation of the subject, was manifested by the favorable expression of all who were called on for remarks. It is hoped that this get-together meeting will react beneficially on the new tuberculosis eradication legislation which is now before the State Legislature.

The officers elected for the ensuing year are: Dr. C. C. Hisel, Oklahoma City, president; Dr. F. R. Knotts, Stillwater, vice-president; Dr. F. Y. S. Moore, McAlester, treasurer; Dr. C. H. Fauks, Oklahoma City, secretary.

C. H. Fauks, *Secretary.*

MISSOURI VETERINARY MEDICAL ASSOCIATION

The Missouri Veterinary Medical Assocation, in conjunction with the Veterinary Department of the University of Missouri, held its annual special short course for graduate veterinarians in the Veterinary Building at Columbia, January 15-18, 1929. About 100 veterinarians attended. Extreme winter weather, consisting of sleet and snow, interfered materially with the crowd.

Many roads were blocked and driving was treacherous most of the week. Much interest was shown by all present. Some of the lecturers from out of the State are well-known in the profession.

Dr. J. L. Wells, of Blue Springs, president of the Association, presided over the various meetings. Dr. J. W. Connaway and his staff, Dr. O. S. Chrisler and A. W. Uren, were largely responsible for the success of the special course for graduate veterinarians. They engineered all arrangements.

Dr. T. E. Munce, president of the American Veterinary Medical Association, delivered an excellent address at one of the evening sessions on how Pennsylvania is handling the Bang abortion disease. He also made some interesting and instructive remarks concerning our national association. Dr. T. H. Ferguson, of Lake Geneva, Wis., had charge of the cattle practice part of the program and he was kept busy lecturing and operating in the clinic.

Prof. L. S. Pammel, nationally known botanist and authority on poisonous plants, was a daily lecturer and many veterinarians learned that some of their neighboring weeds that have been least suspected are dangerous to the stock industry under certain circumstances. Dr. W. H. Wright, parasitologist, U. S. Bureau of Animal Industry, of Washington, D. C., arrived a day late, due to an attack of the flu, but he put in enough overtime answering questions pertaining to parasites of various animals to get credit for the day lost.

Dr. C. N. McBryde, of the U. S. Bureau of Animal Industry, noted for his research in swine diseases, favored the meeting with three papers pertaining to swine and brought out many points of interest to practitioners. Dr. J. V. Lacroix, of Evanston, Ill., favored the meeting with one of his excellent and instructive talks pertaining to diseases of small animals.

Dr. R. L. Laybourne, Chief of Laboratories, State Board of Health of Missouri, read a most interesting paper on the subject of "Undulant Fever in Missouri—Incidence and General Considerations." This was read at the evening session along with the paper given by Dr. Munce, and another by Dr. Connaway on some practical points concerning the Bang abortion disease in cattle and swine relative to human health.

Dr. Sivert Eriksen had charge of the poultry work on the program. The clinic was a very well-arranged affair and demon-

strations of the ordinary conditions encountered in fowls were presided over by Dr. Eriksen.

Pulmonary edema in swine and other aninals, as discussed by Dr. J. D. Ray, brought forth many interesting questions and ideas that were of value to the practitioners present. The Association has been fortunate in being able to have the heads of the various department of the Agricultural College give them first-hand information on various subjects.

Prof. A. C. Ragsdale gave a most interesting lecture on the subject of "Feeding the Dairy Cow for Health and Production." Prof. Ragsdale gave comparisons of various cases of feeding homegrown feeds and otherwise; especially pointing out the advantages in using home-grown feeds over those that are purchased at a higher price that are not any better. Many commercial feeds were used for comparisons. Prof. M. T. Foster, of the University, gave a most interesting discourse on "Feeding and Care of Sheep."

Prof. L. A. Weaver favored the Association with a most instructive talk on swine feeding experiments. The University of Missouri is taking an active part in the work of demonstrating the advantages of home-grown feeds for various animals over commercial feeds that are compounded and sold by high-pressure salesmen, principally for the money they bring. The faculty gave the veterinarians present all the advantage of information they had gathered so that they may go back to their respective communities and help combat this ever-increasing army of professional parasites living off the earnings of the ill-informed public.

Some of the clinic presented was most interesting and instructive. Two heifers typically affected with infectious ano-vulvitis were presented. A steer with an extreme case of ascites was presented and operated on. A definite diagnosis as to cause was not found. The animal died during the night and an autopsy revealed an urethral calculus that obstructed the passage of urine, and bladder complications had set in. At least forty gallons of fluid was removed from this animal's abdominal cavity. The veterinarians present chipped in and bought the animal for surgical demonstrations. After the operation, everyone who had contributed was well aware that he had bought extremely "watered stock." An ovarian transplantation was made to demonstrate surgical technic and see what effect the ovarian tissue will have on a normal steer. Observations will be made at

a later meeting. Several autopsies were held on hogs and many small-animal cases were presented.

J. D. RAY, *Secretary.*

NEVADA STATE VETERINARY ASSOCIATION

The 1929 annual meeting of the Nevada State Veterinary Association was called to order in the Agricultural Building, University of Nevada, Reno, January 16, 1929, by the President, Dr. F. H. Baker, at 1:40 p. m. Roll-call showed eleven members and two visitors, Dr. Maurice C. Hall, of Washington, D. C., and Dr. Eugene Hover, of Reno, Nevada, present.

During the meeting the following literary program was presented:

Reports on the 1928 meeting of the U. S. Live Stock Sanitary Association and associated meetings, Dr. Lyman R. Vawter, University of Nevada.
Some Hitherto Unsuspected Sources of Stock Poisoning, M. R. Miller, chemist, Nevada Agricultural Experiment Station, Reno.
Report on the 1929 meeting of the Intermountain Live Stock Sanitary Association, Dr. W. H. Hilts, Elko.
Animal Parasites, Dr. Maurice C. Hall, Chief, Zoological Division, Bureau of Animal Industry, Washington, D. C.
The Present Status of *Brucella Abortus* Infection, Dr. Edwared Records, University of Nevada.

Dr. F. H. Baker presented for consideration a specimen of the so-called "stiff lambs" from a ranch in the Carson Valley. On examination, destruction and autopsy, this animal proved to be a very typical case of acute muscular dystrophy in the young lamb.

The annual dinner was held at the Grand Cafe, eleven members and three guests being present.

The following officers were elected for the ensuing year: President, Dr. G. T. Woodward, Fallon; vice-president, Dr. H. A. Reagor, Reno; and secretary-treasurer, Dr. Edward Records, Reno.

EDWARD RECORDS, *Secretary.*

MARYLAND STATE VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Maryland State Veterinary Medical Association was held at Medical Hall, Baltimore, January 17, 1929, with about forty members in attendance.

The meeting was called to order by the President, Dr. John P. Turner, of Washington, D. C. The presidential address summed up the veterinary situation in America today, painting an opti-

mistic outlook for the future, but pointed out some of the pitfalls that should be avoided. Attention was called to the increased interest taken in the profession by the public, as shown by articles in many journals, and in the daily press. These news-gathering institutions have learned that the falling off in numbers of veterinary students, and the closing of veterinary colleges have a far greater significance than the substitution of power machinery for the horse might indicate. The slight increase in students since 1927, and the increase in salary given federal veterinarians by the Welsh bill, passed by the last Congress, reflects the need for service by the animal industry of America.

It is in this connection that the general practitioner comes into his own. He is now, and probably always will be, the backbone of the profession. He does not work in the lime-light and his name is seldom seen in the headlines of newspapers. Nevertheless he is the first line of defense in this same live stock industry.

During the past year but few men left the profession for other fields of endeavor. Practitioners generally report a prosperous year, and the small-animal men of the cities seem to be almost opulent. A note of warning was sounded in this connection for young men specializing in small-animal work, since a change in business conditions throughout the country might cause a serious decrease in this class of practice. The young veterinarian should not forget his obligation to his country's need and neglect to keep up to date in the control work necessary to combat the ravages of contagious diseases, for this is the basic reason for his existence.

The demand continues for veterinarians in the regulatory work of meat and milk inspection, not only in the federal and state governments, but for municipal and county work. Tuberculosis control has practically taken all unattached veterinarians in the country. There is a demand for veterinarians in the control of poultry diseases. One large soup-manufacturing establishment employs a veterinary inspector to pass upon the health of chickens going into this product.

Some very important research work has been done on animal diseases during the past year. The study made by the British Commission on dog distemper has resulted in the production of a vaccine which may eventually prove to be of great help. The calcium studies on milk fever may also be far-reaching. Undulant fever in man is being diagnosed more frequently, which brings us face to face with the control and proper handling of abortion disease. We, therefore, have a dual function to perform.

We must guard the health of the people as well as the herds of the nation. We should proceed carefully, avoiding scareheads. The dairy industry is fairly prosperous and it needs our support. Let us approach our problems sensibly and encourage the farmer to clean up his herds by segregation and raising his own healthy replacements. It is possible and practical.

The second paper was entitled, "A New Treatment for Mastitis," and was delivered by Dr. F. C. Ryan, of Middletown. The author states:

> Since beginning the use of this product (hexylresorcinol solution—S. T. 37) acute cases of sporadic mastitis have been robbed of much of their terror. Claims that this product is a specific are not made, but when properly used in conjunction with other indicated treatment, much better results are obtained and favorable terminations hastened. If a case is brought to our attention promptly following its origin, our usual procedure is to begin with a brisk cathartic, hot fomentations to the udder for at least fifteen minutes, after which the udder is wiped dry and the affected quarter is milked. A liberal application of iodin ointment is then applied and massaged into the skin. Mixed infection bacterins are then administered, 2 cc as the initial dose, with gradually increased doses at three-day intervals, until four or five doses are given. Eighty cubic centimeters of S. T. 37 solution is then injected into the affected quarter, the injection being made through a teat-tube (previously sterilized). This solution is allowed to remain in the quarter for 12 hours and then withdrawn, using a sterile teat-tube for that purpose, and immediately after withdrawing, another similar dose of the S. T. 37 solution is injected and allowed to remain 12 hours as before. After 24 hours, considerable improvement is usually noted, in which case the injections are continued but only 40 cc of the solution is used, to which three times its volume of water, which has been previously boiled, is added, making 160 cc of mixed solution.
>
> The solution of S. T. 37 is a very powerful, non-toxic, non-irritating, germicidal solution which is very active in the presence of organic matter and in carefully conducted tests at Johns Hopkins Laboratories was found to destroy pathogenic bacteria at a temperature of 99° F. in less than 15 seconds by contact. It has a phenol coefficient of 72.
>
> Since employing the S. T. 37 solution in the treatment of those cases of sporadic mastitis manifesting intense congestion, not a single case has terminated in a permanent induration, nor has the affected quarter atrophied. While some of the more severe cases have terminated with decreased lactation, results have been so far superior to previous methods of treatment that I urge any veterinarian with a cattle practice to give it a trial, having in mind that it should be used in conjunction with such other measures as may be indicated.

The next paper was entitled, "A Study of the Intravenous Test for the Diagnosis of Bovine Tuberculosis." It was presented by Dr. L. J. Poelma, of College Park. It is not reported here, as it will be published later.

Colonel W. George Turner, Chief of the Veterinary Division, Surgeon General's Office, U. S. Army, Washington, D. C., was the next speaker. Colonel Turner reviewed the activities of the Veterinary Corps, U. S. Army, during the past two or three years, the most important of which are as follows:

A new regulation which requires that all meat and meat food products purchased for the army post exchanges, or restaurants situated in posts and catering to military personnel must be Bureau of Animal Industry inspected, the Veterinary Corps taking up the inspection from the point where the Bureau leaves off as has been done heretofore.

A second regulation promulgated requires a physical examination by a veterinary officer of all horses and mules prior to their separation from the service by condemnation and the furnishing of a written report relating to the sick record of the animal and physical condition at the time, and such recommendations as may be desired with reference to the proper disposition or transfer of each animal.

A third regulation consists of a campaign to determine definitely the efficacy of antirabic vaccine, the War Department setting aside six army posts, widely separated geographically, wherein every dog owned, kept, or harbored, must be vaccinated at least once a year for ten years, in the belief that such determination would be of value to the entire country.

The experimental work begun in the fall of 1927, for the control and treatment of intestinal parasites in horses, especially young colts, at the three remount depots of the army, resulted in a definite dosage, preparation of the animal, and methods of administration being worked out, as a consequence of which data have been recorded which, as far as is known, have not heretofore been published.

Colonel Turner made reference also to the splendid work of Major Kelser, of the Veterinary Corps, while a member of the Tropical Research Board in the Philippine Islands, and to the regulations permitting the return of animals, particularly officers' mounts, from the Philippine Islands (now being done for the first time since the Philippine Islands became a United States possession), a procedure found most desirable since heretofore officers found it necessary to sell their horses at whatever price could be obtained or leave them in the United States until their return two or three years later; the one alternative being to take their mounts with them to the Philippines with the full knowledge that they could not be returned to the United States. Congratulations and good luck to you, Colonel Turner.

The last paper was on "The Control of Bang Disease in Cattle," and was presented by the Secretary. It is not reported here as it will be published later.

At the business meeting the Association approved a set of plans for the control of contagious abortion in cattle in the state of Maryland. A bill for the practice of veterinary medicine was approved and turned over to the Legislative Committee, for introduction in the Legislature, which is now in session. A list of names was approved and the Secretary was instructed to transmit the same to His Excellency, The Governor, from which to appoint a member of the State Veterinary Medical Examining Board; a Publicity Committee was also appointed.

The officers elected for the ensuing year were Dr. J. P. Turner, Washington, D. C., president; Dr. J. B. Koerner, Jr., Sykesville, vice-president; Dr. E. M. Pickens, College Park, secretary-treasurer; and Drs. R. V. Smith, Frederick, and J. W. Hughes, Ammendale, members of the Executive Board.

E. M. PICKENS, *Secretary-Treasurer.*

CONFERENCE FOR VETERINARIANS AT CORNELL UNIVERSITY

The twenty-first annual Conference for Veterinarians was held in James Law Hall, January 17-18, 1929, New York State Veterinary College at Cornell University, Ithaca, N. Y. Dr. H. J. Milks presided at the first session. Dean Moore opened the morning session of the first day with a few remarks of greeting and welcome to those in attendance. Dr. P. A. Fish was next to appear on the program. He gave a talk on "Blood Phosphates and Calcium in Milk Fever." The phosphate and calcium content of the blood were shown to be much below normal in the pre-inflation samples of blood. They both rise as a result of inflation. The phosphates rise more rapidly than the calcium. Dr. Fish suggested that the condition of milk fever may be more the result of phosphate deficiency than of calcium. The relation of the phosphates to the dextrose in the system was also compared. Especial mention was made of the need of hexose phosphates to govern sugar consumption in the tissues of the body.

Dr. Paul B. Brooks, Deputy Commissioner of Health, State of New York, Albany, discussed "The Relation of the Veterinarian to the New Milk Code." The new state code has been in operation for only a short time and there was considerable interest in the interpretation of the code which Dr. Brooks presented. Dr. F. D. Holford, Chief Veterinarian of Borden's Farm Products Company, discussed "Milk Sanitation," illustrating the subject

with a very fine motion picture. Dr. L. J. Tompkins, of the Sheffield Farms, discussed the subject. The next talk was by Dr. W. G. Hollingworth, of Utica, who took as his subject, "Meat Inspection in New York State." This paper was an interesting discussion of the author's own work in that field. He made a strong plea for a wider interest in the work; for more attention to the subject on veterinary programs; and for a closer cooperation on the part of health departments, city and state.

Dr. E. L. Brunett gave an illustrated talk, "Practical Control of Intestinal Parasites of Poultry by Confinement Rearing." The talk and discussion demonstrated that there was considerable success in parasitic control in confinement rearing.

Dr. R. R. Birch presided over the afternoon session. Dr. W. A. Hagan was the first speaker. He spoke of "Subcutaneous Lesions Which Sometimes Induce Tuberculin Hypersensitiveness in Cattle." The subject matter of the paper was based upon work carried out by Dr. Hagan and his associates at Cornell University. Dr. M. J. King, Metropolitan Life Insurance Company, Mt. McGregor, N. Y., detailed the results of "Experiments with B. C. G. Vaccine." The discussion dealt with work carried out on people, the monkey and small animals, but did not touch upon the larger domestic animals. It occasioned considerable discussion.

Mr. H. J. Henry, Assistant State Commissioner, Agriculture and Markets, Albany, N. Y., was to have spoken on "Progress in Eradicating Bovine Tuberculosis," but was not able to be present. Prof. C. F. Warren, professor of Agricultural Economics at Cornell, charted "Cycles for Low and High Prices for Live Stock." Prof. Warren is supreme at such interpretations and his discussion met with great favor. Prof. L. A. Maynard, also of the Agricultural College at Cornell, gave a paper, "The Influence of Nutrition on the Nutritive Value of Milk." The role played by proteins, carbohydrates, fats, vitamins and the various salts was the basis of the discussion. It was pointed out by the author that many claims for the influence of the vitamins and such salts as those of calcium and phosphorus in increasing such constituents in milk were extravagant and were not borne out by later experimental evidence.

Alumni meetings and a smoker constituted the program for the evening.

Dr. D. H. Udall presided at the morning session of the second day. Dr. C. E. Hayden presented a review of the work done at

the College on "Sugar, Guanidine and Cholesterol in the Blood of the Cow in Milk Fever." Dr. Cassius Way gave a summary of his observations on "The Diagnosis of Obscure Genital and Systemic Infections in Horses by Complement Fixation." Dr. E. R. Steel, of Kansas City, Mo., gave an illustrated talk, "Some Essential Features in Small Animal Hospitalization and Practice." Pictures of the interior and exterior arrangement of the new hospital of Dr. Steel, apparatus and methods used in diagnosis, and ways and means for doing things in small-animal practice were very helpful to the interested practitioners in the crowded room.

Dr. C. H. Chase, of Akron, Ohio, gave a paper on "Regular Monthly Herd Treatments." This paper was made very instructive by the demonstration of apparatus, instruments and methods used in his cattle practice. Mr. A. J. Glover, editor of *Hoard's Dairyman*, Fort Atkinson, Wis., gave a wonderful speech on "How Veterinarians Can Be of Larger Service to the Live Stock Industry." Editor Glover has thoroughly sensed the problem of the live stock owner in relation to disease. He has also a fine conception of the part the veterinarian should play in the solution of the problems confronting the stock-owner. He had the power as a speaker to impress these two fine conceptions upon the minds of his interested listeners.

Dr. W. A. Hagan directed the afternoon session. Dr. D. H. Udall spoke on "Necrobacillosis." He outlined the forms of necrobacillosis as it occurs in cattle, laying emphasis upon the etiology, symptoms and treatment of foot-rot in the dairy herd. Dr. J. N. Frost spoke on "Hernia." He discussed the proper ways of operating for umbilical and scrotal hernia in the colt and calf, stressing the importance of an early operation in the case of the calf and the advisability of delaying it at least a year in the case of the colt. Dr. H. J. Milks gave a talk on "Some of the Newer Remedies." He reviewed an extended list of the newer remedies and stated the advantages claimed for each. Many of them, he pointed out had not been used enough yet to recommend them over the older and better-known preparations. Dr. R. R. Birch took up "Questions and Answers Regarding Bang Abortion Disease." He summarized the answers to questions on bovine abortion which had been sent in to the College during the year. He also demonstrated a simple method for drawing blood and labeling the bottles.

The evening meeting of this day was a dinner meeting. Dr. P. A. Fish added to his already marked reputation as a presiding officer. Prof. Wm. A. Hammond, dean of the University Faculty, gave an address. He spoke of the splendid work done by Dean Moore in directing the work of the Veterinary College; of the respect in which he was held by his colleagues on the general faculty; of the combination of teaching and research work carried out; and of the marked spirit of cooperation and loyalty which was known to exist within the faculty of the Veterinary College. Dean Moore read a paper on "The Progress in Veterinary Education and Service at Cornell University 1896-1929." As he traced the rise of veterinary service, he showed that the importation of European live stock brought disease to America and so increased the need for veterinary medicine.

Dr. A. D. White, one of the founders of Cornell University, saw the need for research in agriculture and veterinary medicine. Dr. James Law was brought from London to fill the need for veterinary medicine. The work of this great scholar and teacher laid the foundation for the superstructure in veterinary medicine at Cornell. Dr. Law struggled for twenty-six years to bring up the requirements for practice and bring about the foundation of a veterinary college on suitable terms. Twice he refused support because he thought it to be inadequate. In 1893 he made such a speech before the State Agricultural Society that legislation was enacted in 1894 and signed by Governor Flower, which made the College possible. The institution was opened in 1896. Governor Flower is also donor of the funds which made the Flower Library possible.

The increase in the Faculty from seven at the foundation to over thirty at the present time is also traced. Dr. James Law and Dr. W. L. Williams were the first members of the Faculty. To the original appropriation of $150,000 for the buildings and equipment has been added $466,000. The funds for maintenance have increased from $25,000 to $162,000. The Faculty and alumni have justified the sums spent by New York State. Out of 676 graduates, 400 have settled in New York and 350 of the graduates have gone into practice. The rest of the active list are in the other activities of the profession, such as teaching, research, milk inspection, county and federal work and army service. This first generation of graduates under higher educational standards has justified the efforts of those who labored for

the higher standards and is a hopeful sign for the generations yet to come.

Several prizes are awarded each year in various phases of the work of the College. These prizes are an incentive to better and more fruitful work on the part of eligible students. A graduate fellowship and several tuition scholarships are open to entering students.

The business of the Faculty is pointed out to be teaching and research. Teaching has had its fruition in the large number of graduates successful in the various activities of the profession. Research has been productive of noted advances in all phases of veterinary science. These contributions, as outlined by Dean Moore, are rather too numerous for such a short review. Many discoveries were the work of the original faculty, many have been made by the younger men and many are yet to be made, for the spirit of research, as fostered and guided by Dean Moore, has grown with time. Dean Moore quotes Dr. Law when he says: "The work of the College deals preeminently with life. The reason for its being lives. No goal attained will ever mark the finish of that work."

The twenty-first annual conference has more than lived up to the standard set by the twentieth. The wonder persists that the last can have been so good and the next still be better. It is done and it has been done under the guidance of one of the greatest and best loved directors of veterinary education and research to have guided the destinies of any institution of any time or place.

May it fall to the lot of his successor, who shall guide the twenty-second conference, to make it better than this one just closed, the best of them all to date.

C. E. HAYDEN, *Reporter.*

SOUTH CAROLINA ASSOCIATION OF VETERINARIANS

The South Carolina Association of Veterinarians held their annual business meeting in Columbia on Tuesday evening, January 22, 1929. The meeting was in the form of a banquet and was largely attended by the members. After the business session, the election of officers was held which resulted as follows: President, Dr. J. W. Lawhorn, Hartsville; vice-president, Dr. B. C. Talley, Bennettsville; and secretary-treasurer, Dr. M. R. Blackstock, Spartanburg. Dr. Benj. McInnes was re-elected to the State Board.

M. R. BLACKSTOCK, *Secretary*

CENTRAL CANADA VETERINARY ASSOCIATION

The annual meeting of the Central Canada Veterinary Association was held January 23, 1929, in the Windsor Hotel, Hull, Que. Following the meeting Dr. M. C. Baker, formerly professor of anatomy, Faculty of Comparative Medicine, McGill University, Montreal, and one of the oldest veterinarians in active practice in Canada, was the guest of honor at a banquet. The spacious banquet hall of the Windsor Hotel was crowded. Dr. George Hilton, Veterinary Director General, was toastmaster and among the invited guests were Dr. J. Amyot, C. M. G., Deputy Minister of Health, and Dr. J. H. Grisdale, Deputy Minister of Agriculture. An orchestra and musical program added to the enjoyment of the evening. In suitable words Dr. Hilton introduced the guest of the evening.

Dr. Baker gave a very interesting address and described the advances made by veterinary science that it had been his privilege to witness in this last half-century. He state that there was no reason for pessimism regarding the veterinarian, providing he was properly trained and he kept himself informed regarding the advances made in science. The danger to veterinary science lay rather in the improperly trained individual and in the one who ceased being a student when he left college.

The regular meeting was held in the afternoon, the scientific program being composed of the following papers:

"Equine Pernicious Anemia," Dr. A. E. Cameron.

"Diagnosis of Pregnancy," Dr. N. M. Bellamy.

"Some Common Grave Diseases of Dogs," Dr. Robert Barnes.

"Conditions Resulting in Sterility," Dr. R. L. Conklin.

A committee, formed last year for the purpose of studying the present status of veterinary science and making recommendations for its improvement, brought in a very interesting report. One of the principal points dwelt upon was the relation of our veterinary colleges to the universities. Members of the Committee interviewed many young high school graduates and one of the principal objections to taking a course in veterinary science was the fact that the colleges are located away from university centers and the student is, therefore, divorced from the broader training of university life. Also, no provision is made for reciprocity in subjects or for the taking of combined courses in arts and veterinary science. The Committee was of the opinion that veterinary science today should be more closely connected with

the field of medicine, since both are based on the same basic principles and have a great deal in common. Therefore, there should be a close relationship between the training of the two professions.

The Committee was of the opinion that there was room in Canada for another college, embodying these principles, and recommended that the Faculty of Veterinary Science be re-opened at McGill University, provision being made for reciprocity in subjects and the taking of a combined course in arts and veterinary.

CHAS. A. MITCHELL

ARKANSAS VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Arkansas Veterinary Medical Association was held at the Marion Hotel, Little Rock, January 24, 1929. Dr. H. C. Boyd, president of the Association, presided.

Dr. C. W. Garrison, State Health Officer, was not able to be present. His subject was "Relation of the Veterinary Profession to Public Health." Dr. Sivert Eriksen, of Kansas City, Mo., gave a very interesting and instructive talk on diseases of poultry.

A discussion of the Standard Milk Ordinance was given by Dr. T. M. Dick, City Veterinarian, of Little Rock, Ark. Dr. W. J. Cross read an interesting paper on retained placenta. Dr. W. L. Davis, of the U. S. Bureau of Animal Industry, presented a well prepared paper on "Ticks."

The question-box was conducted by Dr. J. H. Bux, State Veterinarian, and Dr. R. W. Williams, of Eldorado, gave a talk on "Large Animal Practice." Dr. H. J. Hayes, of Helena, was not on hand to present his paper on tetanus.

Dr. L. B. Ernest, Assistant Chief of the Tuberculosis Eradication Division, Bureau of Animal Industry, discussed tuberculosis eradication from both the public health and economic point of view. The tuberculin test, no-lesion reactors and many other phases of the work also were covered in his address.

A resolution was adopted recommending that an adequate appropriation be made for completion of the campaign for tick eradication and another resolution was adopted recommending that funds be appropriated for the eradication of tuberculosis in cattle, including indemnity for diseased animals culled out of herds.

The Association voted to sponsor a section of the Southwestern Tuberculosis Conference, scheduled to meet here in January, 1930.

The following officers were elected: President, Dr. R. W. Williams, Eldorado; vice-president, Dr. Walter Martin, Jonesboro; and secretary-treasurer, Dr. H. L. Fry, Little Rock.

H. L. FRY, *Secretary-Treasurer*

MISSISSIPPI STATE VETERINARY MEDICAL ASSOCIATION

The twenty-third annual meeting of the Mississippi State Veterinary Medical Association was held at A. & M. College, Mississippi, January 28-29, 1929. Due largely to the untiring efforts of Dr. C. B. Cain, Professor of Veterinary Science at the College, this meeting was conceded to be one of the best ever held in the State from the standpoint of interest manifested by those present and the general excellence of the program offered. In spite of very bad weather and the rather inaccessible location of the meeting place, the attendance was good.

The first day was devoted to lectures, a business meeting in the late afternoon and a banquet in the evening. The second day was devoted entirely to a clinic at the Veterinary Hospital at the College. The services of Dr. C. H. Case, of Akron, Ohio, had been secured through the efforts of Dr. C. B. Cain and cattle practice was the principle feature of the meeting. Dr. Case had been secured with that object in view and he did his work well.

For his talk on the first day, Dr. Case chose the subject of "Monthly Examination of Herds to Control Sterility and Abortion." Dr. Case spoke for several hours and great interest was manifested in what he had to say, all of which was certainly very profitable to the veterinarians having any cattle practice. Dr. Case described his method of handling contagious abortion and sterility and he was strongly of the opinion that his method possesses practical value based on his own experience.

Two other prominent speakers who contributed to the program were Prof. J. S. Moore, head of the Dairy Department of A. and M. College, and Prof. G. S. Templeton, of the Animal Husbandry Department. Prof. Moore is the leading exponent of dairying in Mississippi. He established the first successful creamery in the South. In the face of almost insurmountable difficulties he has been successful in his fight to make the lime hills and prairie section of Mississippi an important dairy section. There are now

several large condenseries, many creameries and cheese-plants located in this territory. "The Dairy Industry in Mississippi" was the subject of Prof. Moore's talk. He spoke of his appreciation of what the veterinarian has done for dairying and the great need for his services in developing the dairy industry in Mississippi.

Prof. Templeton's subject was "Mule Feeding Experiments—Self-Feeding and Results of Cottonseed Meal Feeding." This is a subject of considerable interest to veterinarians and planters in the Cotton Belt. A great deal of interest was shown in Prof. Templeton's address.

Dr. R. H. Stewart, of Rolling Fork, gave an interesting talk on "Sidelights of the Minneapolis Meeting of the A. V. M. A." Dr. Stewart spoke of the pleasure and profit that one gets from attending meetings of the A. V. M. A. and at the same time he emphasized the importance of all veterinarians joining the national organization.

The banquet in the evening was well attended. A number of local witty and eloquent after-dinner speaker and musicians kept the banqueters highly entertained and in a roar of laughter until a late hour. The music rendered was of an unusually high class. Three prominent veterinarians were called upon for speeches at the banquet. They were: Drs. C. A. Cary, of Auburn, Ala., C. H. Case, of Akron, Ohio, and C. E. Salsbery, of Kansas City, Mo.

On the second day the veterinarians met at nine o'clock for an all-day clinic. Excellent arrangements had been provided to make the clinic a success. Animals were provided for the various demonstrations. Dr. Case went to work immediately and demonstrated his method of treating sterility with the aid of instruments of his own design. He also demonstrated his method of reading agglutination tests for contagious abortion, his technic for an operation to relieve hard milkers, and treatment of mastitis and retained placenta.

Dr. Joe A. Beavers, of Canton, performed a classical operation on a case of fistula of the withers. Dr. C. A. Cary spayed a heifer. Epidural anesthesia was demonstrated on a cow. An operation was performed to cure milk fistula. Bull rams and lambs were castrated with the emasculatome and by other methods. Tuberculin injections were demonstrated by Dr. J. W. Giffie and mallein injections by Dr. W. O. Hughes.

In the Y. M. C. A. Building Dr. C. B. Cain had on display a large collection of parasites that infest live stock in Mississippi. This was of especial interest to the veterinarians present. The entomologist of the College was present throughout the first day of the meeting and gave information relative to the parasites.

The Jensen-Salsbery Laboratories, of Kansas City, had a large array of instruments, biologics and pharmaceutics on display.

Officers for 1929 were elected as follows: President, Dr. C. D. Crawford, Rolling Fork; vice-president, Dr. C. B. Cain, A. & M. College; 2nd vice-president, Dr. E. S. Norton, Greenville; secretary-treasurer, Dr. J. T. Alston, Tupelo.

J. T. ALSTON, *Secretary*

MICHIGAN'S SIXTH ANNUAL SHORT COURSE

The sixth annual Post-Graduate Short Course for Veterinarians conducted by the Veterinary Division of Michigan State College of Agriculture and Applied Science, in cooperation with the Bureau of Animal Industry, Michigan State Department of Agriculture, Bureau of Animal Industry, U. S. Department of Agriculture and Michigan State Veterinary Medical Association, came to a successful close February 1. It was the most successful effort yet undertaken by these cooperating parties and its success indicates what can be done by cooperation.

In the summer of 1929, the American Veterinary Medical Association, the largest veterinary association in existence, honors Michigan by holding its annual meeting in America's fourth largest city, our metropolis, Detroit. Our State Association plans no program for June and only such meeting as is required by law will be held at that time at Lansing. Every Michigan veterinarian and all their confrères in the neighboring states and Canada will be at the great annual meeting of the A. V. M. A. at Detroit. Our State Association had voted to cooperate with us in our effort to make the sixth annual short course a success even beyond what has been achieved in former years. To this end our Tuesday program was provided by the Michigan State Veterinary Medical Association.

Dr. T. A. Sigler, of Greencastle, Indiana, ex-president of the A. V. M. A., and our own Professor Hudson revived our interest in the harse. Professor Anthony, of the Dairy Department, proved himself a most worthy successor of Professor Reed, who has recently become Chief of the Bureau of Dairying of the U. S. Department of

Agriculture. Dr. W. A. Hagan, of Cornell, gave a very scholarly and instructive illustrated lecture on Johne's disease which is appearing in Michigan in a number of places.

Our old friend, Dr. L. H. Smith, who has charge of the veterinary work on one of the largest dairy farms in America, at Mt. Clemens, Michigan, assisted in the abortion program. We were happy to have with us again our enthusiastic friend, Doctor Hoskins, "Professor of A. V. M. A."

A feature of the evening program was a symposium on building up a large-animal practice. The matter was presented by Dr. F. M. Blatchford, Brighton; Dr. A. J. Erickson, Charlotte; Dr. J. P. Hutton, M. S. C.; Dr. C. F. La Bar, Ypsilanti; and Dr. B. A. Perry, Hastings.

Our President R. S. Shaw, who had studied veterinary medicine at the Ontario Veterinary College, made a pleasing and encouraging address, as did also the secretary of our governing board, Mr. H. H. Halladay, who has an honorary veterinary degree.

Small-animal day was featured by the participation of one of America's most eminent practitioners, Dr. F. E. McClelland, of Buffalo, N. Y., whose modest, charming manner and mastery of his subject pleased the Michigan veterinarians.

Dr. A. S. Schlingman, of Parke, Davis and Company, reviewed a very pressing topic, rabies immunization. Professor Brown, of the Animal Husbandry Department, and one of the leading practitioners, Dr. F. E. Stiles, of Battle Creek, opened our eyes to the importance and some of the hidden secrets of sheep management and practice.

Again there was featured a symposium on building up a small-animal practice. The following veterinarians participated: Dr. A. E. George, Flint; Dr. E. E. Patterson, Detroit; and Dr. F. E. Stiles, Battle Creek.

Poultry day was unusually successful, due to the contributions of Dr. Hubert Bunyea, of the Bureau of Animal Industry, U. S. Department of Agriculture, and Prof. L. P. Doyle, of Purdue University, two of America's leading authorities on poultry disease. A symposium on building up a poultry practice was also listed and the following veterinarians were in attendance to discuss the subject: Dr. F. E. Caswell, North Adams; Dr. J. A. Schaefer, Bangor; and Dr. L. A. Wileden, Mason.

Members of the staff of the Veterinary Division, both the College and the federal and Michigan Departments of Agriculture

contributed as usual. We shall not make mention of their names or their subjects, but we shall take this opportunity to say that they show increasing enthusiasm from year to year.

One of the features of our short-course program is an arrangement for conferences on Monday and Friday. Appointments are made with members of the staff and the visiting veterinarians have an opportunity to meet them in their laboratories and offices and settle some of the problems that have burdened them. In this way it is possible for the practitioners to get accurate and first-hand information on some of the latest points in technic.

With the close of our short course we were impressed with the hopefulness of the veterinary situation, both with respect to practice and education.

On the occasion of the banquet, some very delightful entertainment was furnished by some of our students, who gave a demonstration of two Finns in a cow-selling operation in the Upper Peninsula of Michigan and two clever artists who put to shame the "Two Black Crows." Thus was lightened the otherwise very serious and very heavy program.

W. G.

CONNECTICUT VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Connecticut Veterinary Medical Association was held in Hartford, Conn., at the Hotel Garde, February 6, 1929. The following officers were elected for the ensuing year: President, Dr. W. J. Southey, Bridgeport; 1st vice-president, Dr. M. R. Powers, Norwalk; 2nd vice-president, Dr. J. J. Kavenek, Hartford; and treasurer, Dr. Thomas Bland, Waterbury.

The meeting was devoted to general discussion, during which many subjects were touched upon. Although the attendance was small due to bad weather conditions, those present considered it a worth while meeting. It was voted to hold the next quarterly meeting in New Haven.

E. H. PATCHEN, *Secretary*

Cuban Veterinary School to Move

Dr. Francisco Etchegoyhen, dean of the Veterinary School of the University of Havana, reports that the Veterinary School is to be moved from Havana to the Agricultural Experiment Station grounds at Santiago de las Vegas, about twelve miles south of Havana.

NECROLOGY

SAMUEL SHELDON

Dr. Samuel Sheldon, of Trenton, Mo., died December 11, 1928, while hunting near Trenton with two friends.

Born on a farm near Turney, Mo., April 20, 1873, Dr. Sheldon attended local schools and entered the Kansas City Veterinary College in 1894. He was graduated in 1896 and later entered the Kansas City University of Medicine. After finishing his medical course, Dr. Sheldon entered veterinary practice at Trenton and continued to practice up to the time of his death, except for an interval of two years when he served as State Veterinarian under Governor Hadley. He was a deputy state veterinarian for many years and lectured for a time at the Kansas City University of Medicine.

For many years Dr. Sheldon was a member of the Missouri State Board of Veterinary Medical Examiners and was president of the Board at the time of his death. He served eight years as County Coroner. He also served as County Physician for eighteen years and as City Physician for fifteen years, and during the World War he served as examining physician for the local pension examining board. He was a member and former president of the Grundy County Medical Society and, a few years ago, was Assistant Collaborating Epidemiologist to the U. S. Public Health Service.

He is survived by his widow, one daughter, one sister and two brothers.

A. CHARLES MADDEN

Dr. A. C. Madden died December 23, 1928, in Los Angeles, Calif., after having been in poor health for over a year. Dr. Madden was a native of England, but he had resided at Glencoe, Illinois, a suburb of Chicago, for a good many years. He was graduated from the McKillip Veterinary College in 1919. In addition to his practice at Glencoe, he maintained a large boarding kennel, where he handled and conditioned many famous dogs. Dr. Madden was very well known among dog fanciers in both the United States and Canada and enjoyed an enviable reputation as a judge of English bull dogs and also as a writer on bull dog

records. For many years, he was a contributor to the *Dog Fancier*. His articles on dog subjects also appeared in other publications in the same field.

PHILLIP SANDERS

Dr. Phillip Sanders, of Browns Valley, Minn., died at the State Sanatarium, at Walker, Minn., December 26, 1928.

Born at LaMorle, Illinois, December 4, 1884, Dr. Sanders received his veterinary education at the Kansas City Veterinary College. He was graduated in 1912. In the spring of that year, he located at Browns Valley and engaged in general practice there until a short time before his death. Dr. Sanders was not married. He is survived by his father, two brothers and one sister.

Dr. Sanders joined the A. V. M. A. in 1927.

J. P. ANDERSON

Dr. J. P. Anderson, of Rochester, Minn., died October 20, 1928. He was a graduate of the Ontario Veterinary College, class of 1888 and was in general practice at Rochester for many years. He joined the A. V. M. A. in 1909 and was a member of the Minnesota State Veterinary Medical Association.

FRANK J. BABBITT

Dr. Frank J. Babbitt, of East Lynn, Mass., committed suicide by shooting himself in the head, December 30, 1928. He had been in ill health for some time and suffered intense pain.

Dr. Babbitt was a graduate of Harvard University, class of 1897. For many years he was recognized as one of the leading horsemen in the community and served as president of the Lynn Gentlemen's Driving Club.

He joined the A. V. M. A. in 1911.

PATRICK W. LOOB

Dr. Patrick W. Loob, of Axtell, Kansas, is reported to have died in January, 1929. He was engaged in digging a well and was lowered into the well too soon after a blast had been touched off. The gases generated asphyxiated Dr. Loob. He was a graduate of the Kansas City Veterinary College, class of 1911, and was located in Sioux Falls, S. Dak., before going to Kansas.

H. H. BISHOP

Dr. H. H. Bishop, of Charlottetown, Prince Edward Island, Canada, died of pneumonia, at Moncton, New Brunswick, January 10, 1929. He was born at Ottawa, Ontario, March 16, 1888, attended grade and high schools and was graduated from the Ontario Veterinary College in 1915.

On July 29, 1915, he was married to Olive M. Wallis and entered the Royal Army Veterinary Corps the same day. He was sent overseas and saw service in France, Belgium, Egypt and Macedonia. He was honorably discharged, July 16, 1918, with the rank of captain. Later he accepted an appointment as Veterinary Inspector in the Health of Animals Branch, Canada Department of Agriculture.

Dr. Bishop joined the A. V. M. A. in 1923.

CHRISTIAN F. BEHNER

Dr. Christian F. Behner, of Marshall, Illinois, died at his home January 13, 1929, following an attack of flu. He was in the employ of the Illinois Department Agriculture and engaged in tuberculosis eradication work among poultry, with headquarters at Pekin, Ill.

Born on a farm near Clarksville, Ill., January 27, 1872, Dr. Behner attended local grade schools and then entered the Ontario Veterinary College. Following his graduation, in 1894, he located in Marshall and continued in general practice until about one year ago.

Dr. Behner is survived by his widow, five sisters and two brothers.

GEORGE R. INGLIS

Dr. George R. Inglis died at his home in Auburn, Maine, January 28, 1929. Death was due to uremic poisoning.

Born at Campbellville, Ontario, December 22, 1874, Dr. Inglis attended local schools and then entered the Ontario Veterinary College, from which he was graduated with the class of 1896. He immediately located in Auburn, where through his splendid ability he built up a very successful practice.

Dr. Inglis joined the A. V. M. A. in 1924. He was a member of the Maine Veterinary Medical Association. He was a member

of the Masonic Order, being a Knight Templer and a Thirty-Second Degree Mason and a Noble of the Mystic Shrine. He was also a member of the local Kiwanis Club.

He is survived by his widow and one daughter.

L. K. G.

BERT H. VANCE

Dr. Bert H. Vance, of Concordia, Kansas, was killed, January 28, 1929, when his automobile was struck by a passenger train at a grade crossing near his home.

Born at Clinton, Missouri, November 6, 1881, Dr. Vance was graduated from the Sedalia (Mo.) Business College and later the Kansas City Veterinary College, class of 1911. He was located at Warrensburg, Mo., for a short time and then moved to Concordia. For the past twelve years he was the owner of a racing stable at that place. His stable consisted of about a dozen horses which he raced in the western circuit last season. Dr. Vance is survived by his widow and two sons, his mother, four sisters and two brothers. Mrs. Vance is a daughter of Dr. C. H. Gaines (K. C. V. C. '06), of Concordia, Kans.

LLOYD ASHLOCK

Dr. Lloyd Ashlock, of Carrollton, Ill., died January 31, 1929, on his 51st birthday, after an illness of five weeks due to pneumonia.

Born near Greenfield, Ill., January 31, 1878, Dr. Ashlock's family moved to Carrollton soon afterward. He attended local schools and the Kansas City Veterinary College. Following his graduation in 1905, he entered general practice at Carrollton and continued until his health failed. Dr. Ashlock never married. He is survived by his mother, one brother and two sisters.

HENRY HAYNES

Dr. Henry Haynes, of Jackson, Michigan, died February 3, 1929, at the age of 86 years. Death followed an attack of influenza.

Born in New York State, Dr. Haynes attended the American Veterinary College. He later entered the Grand Rapids Veterinary College and was graduated in 1901. He was a very successful practitioner and was a man of excellent habits. He leaves one son, a veterinarian, Dr. W. A. Haynes, of Jackson, Mich.

E. F. LOWRY

Dr. E. F. Lowry, of Ottumwa, Iowa, died at his home, February 3, 1929, after a protracted illness. He was born in Rush County, Indiana, May 7, 1885, and his family moved to Iowa when he was eleven years old. Dr. Lowry was a registered non-graduate and held certificate 312. At one time he was an assistant state veterinarian and for another period state dairy and milk inspector. He was elected president of the Hawkeye State Veterinary Medical Association on three occasions.

H. S. WILLIS

Dr. H. S. Willis died by his own hand at his home, Gordonsville, Va., February 6, 1929. He was 58 years of age and is survived by his widow and five children.

Dr. Willis was a graduate of the New York College of Veterinary Surgeons and spent all of his professional career in Virginia. He practiced at Orange before locating at Gordonsville. For many years he was a member of the Virginia State Veterinary Medical Examining Board and for more than twenty years he was a member of the Virginia State Veterinary Medical Association. Dr. Willis joined the A. V. M. A. in 1913, but resigned his membership five years later.

IRVING B. PAXTON

Dr. Irving B. Paxton, of Sioux City, Iowa, died February 7, 1929. Death was due to an attack of heart disease, following the extraction of several teeth, in a dentist's office. Dr. Paxton complained of being sick after his teeth had been extracted and he sat in the dentist's chair for a short time to rest. The dentist left the room and had been gone only a few minutes when the office girl summoned him and said Dr. Paxton was dying. A physician was called, but Dr. Paxton was dead before medical aid could be given.

Born in Ames, Iowa, October 19, 1883, Dr. Paxton lived there for many years. He graduated from Iowa State College in 1905. Later he located at Orange City, Iowa, where he was married June 30, 1910. Dr. Paxton then went to California and was located at Red Bluff, in the employ of the Bureau of Animal Industry. From there he was transferred to Fort Worth, Texas, and later to Sioux City, Iowa. Up until about two years ago,

Dr. Paxton was employed by the Purity Serum Company, as Secretary and Sales Manager. During the past two years, Dr. Paxton operated a garage in Sioux City.

Dr. Paxton joined the A. V. M. A. in 1910. He is survived by his widow, his mother and one brother. Interment took place at Ames, Iowa.

W. L. GREENING

Dr. W. L. Greening, of Long Beach, Calif., one of the best known veterinarians in southern California, was killed in an automobile accident, February 8, 1929. His machine collided with another car and he was thrown thirty-five feet, landing against the curbing of the street.

Born at Loami, Illinois, December 27, 1888, Dr. Greening received his veterinary training at the McKillip Veterinary College. He was graduated in 1913. For a short time he was in the service of the U. S. Bureau of Animal Industry. He entered the Veterinary Corps during the war and was ordered to Camp Greenleaf. Following the war he located at Waukonda, Ill. At the time of his death Dr. Greening was in private practice and conducted two small-animal hospitals in Long Beach.

Dr. Greening joined the A. V. M. A. in 1919. He is survived by his widow and two children.

HOWARD C. JOHNSON

Dr. Howard C. Johnson died very suddenly at his home in Gresham, Ore., February 13, 1929.

Born in Dallas County, Iowa, October 8, 1876, Dr. Johnson received his veterinary education at the Iowa State College. Following his graduation in 1914, he entered general practice at Brighton, Iowa, and remained there for several years. In 1927, he went to Portland, Ore., and received an appointment on the city meat inspection staff. He remained in this position until 1922, when he resigned to go into private practice again. He located at Gresham, Ore., where he enjoyed a good practice.

Dr. Johnson is survived by his widow and seven children, of whom three daughters and a son were by a former wife, deceased; his aged mother, five sisters and four brothers. The funeral was largely attended, the pall bearers all being veterinarians and intimate friends. He was buried at Lincoln Memorial Park, February 15.

E. E. C.

DUNCAN C. BELL

Dr. Duncan C. Bell, of Detroit, Michigan, was killed instantly the night of February 14, 1929, when his sedan was struck and demolished by an interurban car on the road eight miles west of Fremont, Ohio. Dr. Bell was returning home after having made a professional call near Fremont.

Born on a farm near London, Ont., Dr. Bell attended a normal school in London and at the age of 15 went to Pennsylvania where he trained and drove fast horses. He returned to London, where he continued to train horses for about seven years. He then entered the Ontario Veterinary College and was graduated in 1904. Two years later, he located in Detroit and opened the West Side Veterinary Hospital. He served as City Veterinarian for several years and then confined his practice almost exclusively to the treatment of lamenesses of race horses.

Dr. Bell is survived by his widow, three daughters, one son, his mother and one sister.

CHARLES F. BEHRENS

Dr. Charles F. Behrens, of O'Fallon, Ill., died in St. Elizabeth's Hospital, February 18, 1929, the result of injuries received the night before, when he was struck by an automobile while walking on the Midland Trail west of O'Fallon, near Glenview.

Born in O'Fallon, Ill., September 22, 1875, Dr. Behrens attended local schools and later entered the Chicago Veterinary College. He was graduated in 1904 and immediately returned to O'Fallon, where he practiced until his death. He is survived by his widow, as well as a former wife, two daughters, one son, three brothers and four sisters.

CHARLES WILLIAMS

Dr. Charles Williams, of Philadelphia, Pa., died February 22, 1929, at the age of 72 years.

Born near Moorestown, N. J., Dr. Williams obtained his preliminary education in private schools and at the Friends' School, Westtown, Pa. He was a member of the first class of the University of Pennsylvania Veterinary School, graduating in 1887. For two years he was quizmaster in surgery and medicine at the Veterinary School, and, following the resignation of Dr. R. S. Huidekoper, he lectured on theory and practice for one year. He

was a member of the Board of Managers of the U. of P. Veterinary Hospital for a long time.

Ever since his graduation, Dr. Williams enjoyed a large city practice in Philadelphia. He remained active until the time of his illness. He was a great admirer of horses and drove a horse and carriage daily through the city streets, while attending to his practice.

Dr. Williams was a life member of the Pennsylvania State Veterinary Medical Association, the Keystone Veterinary Medical Association (secretary, 1888-1889) and the Philadelphia Historical Society. He was one of the oldest members of the Board of Directors of the Pennsylvania Society for the Prevention of Cruelty to Animals.

Born a Quaker, Dr. Williams was always a devout member of the Society of Friends, in which he was an overseer. He was a man of unusually high character, who was ever loyal to his ideals, and he will be greatly missed by his friends. He is survived by his widow, four sisters and one brother.

G. A. D.

HERBERT B. HAMILTON

Dr. Herbert B. Hamilton, of New Bedford, Mass., died in St. Lukes Hospital, New Bedford, March 2, 1929, after an illness of one week. Death was due to septicemia, following a scratch inflicted by a cat.

Born in Boisvert, New Brunswick, Canada, 67 years ago, Dr. Hamilton moved to Boston at the age of 20. Four years later he located in New Bedford. After working at his trade as a blacksmith for about twenty years, he decided to study veterinary medicine and entered the New York College of Veterinary Surgeons. He was graduated in 1893 and located in New Bedford.

In 1910, Dr. Hamilton was appointed Inspector of Animals and Milk for New Bedford. Eight years later he was appointed to the same position under the state laws and held it until his death. The New Bedford *Evening Standard* paid Dr. Hamilton the following editorial tribute:

> Among owners of animals he had treated as a veterinarian, as well as by the community as a whole, the news of the death of Dr. Herbert B. Hamilton will be received with genuine regret. He was a man of recognized standing in his profession and was held in high respect as a conscientious public official.

Dr. Hamilton joined the A. V. M. A. in 1904 and would have completed a quarter-century of continuous membership this year. He is survived by his widow, one son, two daughters, one brother and four sisters.

ERNEST M. JONES

Dr. Ernest M. Jones, of Evanston, Ill., died of pneumonia at the St. Francis Hospital, Evanston, December 22, 1928. He was ill only a few days.

Dr. Jones, who was born at Wiarton, Ontario, May 12, 1904, and a graduate of the Ontario Veterinary College, class of 1924, had been a member of the veterinary staff of the North Shore Animal Hospital for about two years. The remains were taken to Wiarton and laid to rest the day after Christmas.

ROBERT G. WALKER

Dr. Robert G. Walker, of Chicago, Ill., died suddenly on March 3, 1929, at the age of 77. Death was due to heart failure.

Born in Scotland, Dr. Walker moved to Chicago in 1878. He was in the dry goods business for several years, but, being fond of animals, he decided to study veterinary medicine. He entered the Chicago Veterinary College and was graduated with the class of 1886. Dr. Walker joined the A. V. M. A. in 1890, when the organization (then the U. S. V. M. A.) met in Chicago for the first time. He was a charter member of the Chicago Veterinary Society and a member of the Illinois State Veterinary Medical Association. He was an honored member of the St. Andrews Society of Chicago.

An up-to-date veterinarian and an affable, Christian gentleman, he was beloved by all who knew him.

A. H. B.

JED BADGLEY

Dr. Jed Badgley, of Tampico, Ill., died March 4, 1929, at his home. Neuralgia of the heart is reported to have been the cause of death. Dr. Badgley was 69 years of age and had been a resident of Tampico for 28 years. He was graduated from the Ontario Veterinary college in 1904. He is survived by two sisters and two brothers.

Our sympathy goes out to Dr. O. Emmitt, of Wichita, Kansas, in the death of his wife, February 11, 1929, after an illness of about one year.

PERSONALS

MARRIAGES

Dr. S. Ter-Michaelian (Iowa '26), of Berkeley, Calif., to Miss Helen Howard, of San Francisco, Calif., December 31, 1928, at San Francisco.

Dr. G. M. Leighow (U. P. '27) to Miss Alice Kear, both of Danville, Pa., March 4, 1929, at Danville.

BIRTHS

To Dr. and Mrs. R. C. Turner, of Orlando, Fla., a daughter, Elizabeth Ann January 19, 1929.

To Dr. and Mrs. Claude H. Reading, of Hopkins, Mich., a son, Richard Adelbert, January 20, 1929.

To Dr. and Mrs. M. C. Linnemann, of St. Joseph, Minn., a son, Mark Cletis, January 30, 1929.

PERSONALS

Dr. John Redmond (Ind. '13) has removed from Mobile, Ala., to Pascagoula, Miss.

Dr. W. W. Shartle (Ind. '09) has changed locations from Tallulah, La., to Monroe, La.

Dr. A. L. Walsh (Chi. '20) has removed from Thief River Falls, Minn., to Wykoff, Minn.

Dr. H. M. Umbstaetter (U. P. '17) has moved from Vermilion, Ohio, to Amherst, Ohio.

Dr. O. F. Cox (Colo. '21) reports a change of address from Audubon, Iowa, to Bedford, Iowa.

Dr. William A. Caslick (Corn. '27) has removed from Hamburg, N. Y., to Port Leyden, N. Y.

Dr. H. B. McMurray (Corn. '24), formerly of Cuba, N. Y., is now located at 30 Ross St., Owego, N. Y.

Dr. James C. Conway (T. H. '14), formerly of Clinton, Ind., now receives his mail at New Goshen, Ind.

Dr. A. A. Goodman (Colo. '15), of Norwood, Colo., is Secretary of the San Miguel Basin Fair Association.

Dr. Clifford C. Wagner (O. S. U. '26), of Newark, Ohio, is under treatment at the U. S. Veterans' Hospital, Outwood, Ky.

Dr. George W. Gillie (O. S. U. '07), of Fort Wayne, Ind., is again serving in the capacity of Sheriff of Allen County, Indiana.

Dr. E. R. Swim (McK. '05) has removed from Altamont, Ill., to Taylorville, Ill., where he will continue in veterinary practice.

Dr. R. R. Clark (K. C. V. C. '05), formerly of Newport News, Va., gives a new address: Grove Plantation, Williamsburg, Va.

Dr. Paul C. Denney (K. S. A. C. '18), formerly of Mountain Grove, Mo., is now in New York City. Address: 424 West 43rd St.

Dr. Thomas B. Heim (O. S. U. '26), formerly of Akron, Ohio, is now located at Alliance, Ohio, where he is engaged in general practice.

Dr. Harry Kline (U. P. '17) reports a change of address from 750 E. Fordham Rd., to 7615 Roosevelt Ave., Jackson Heights, L. I., N. Y.

Dr. Glen D. Grogan (Ind. '07), of Mendota, Ill., has taken over the practice of the late Dr. W. B. Lane (Chi. '12) at 19 N. Lake St., Aurora, Ill.

Dr. A. H. Kraus (St. Jos. '13), of Marengo, Iowa, is slowly recovering from an operation for appendicitis performed the night of December 27, 1928.

Dr. C. J. Heckard (Iowa '98), of Wheatland, Iowa, was obliged to take Mrs. Heckard to a Davenport, Iowa, hospital for a serious laparotomy on February 20.

Dr. J. L. Axby (Chi. '03), of Lawrenceburg, Ind., spoke over the Radio Station WLW, at Cincinnati, on February 9. His subject was "Swine Sanitation."

Capt. J. A. McCallam (U. P. '17), of the Veterinary Corps, U. S. Army, was recently elected President of the Kansas City University of Pennsylvania Alumni Association.

Dr. Clarence H. Nye (McK. '15), of Cambridge, Ill., recently returned to his home after spending several weeks in the hospital, where he was operated upon for appendicitis.

Dr. J. H. Schall (U. P. '28) has resigned his position at the Ellin Prince Speyer Hospital for Animals in New York City and is now back in Philadelphia. Address: 801 North 26th St.

Dr. F. R. Allerton (K. S. A. C. '25), of Hollywood, Calif., has taken over the Cat and Dog Hospital of Dr. E. E. Kimmach (O. S. U. '11), located at 7151 Santa Monica Blvd., Hollywood, Calif.

Dr. E. W. Kline (Ind. '13), of Thorntown, Ind., was named in the will of the late Dr. George H. Roberts, to receive the entire veterinary library and all of the surgical instruments of the deceased.

Dr. C. H. Betty (Mich. '26), of Mattoon, Ill., recently underwent the Pasteur treatment following wounds inflicted by a calf that was suffering from rabies and which Dr. Betty was called upon to treat.

Dr. G. A. Boyd (Colo. '20), of Kansas City, Kans., has accepted a position in the California State Department of Agriculture, at Sacramento, under Dr. J. P. Iverson (San Fran. '06), State Veterinarian.

Dr. C. L. Kern (Corn. '24), division veterinarian for the Dairymen's League Co-operative Association, Inc., has been transferred from Middletown to Utica, N. Y., and now receives his mail at 208 Kempf Bldg.

Dr. Samuel Irwin (Ont. '90), of Battle Creek, Mich., was badly burned about the head in a fire which followed the bursting of the gasoline tank on his car, when it slipped from a jack while being repaired in a local garage.

Dr. N. S. Mayo (Chi. '89), of North Chicago, Ill., was a visitor to Cuba recently and while in Havana was honored by election to honorary membership in the Cuban National Veterinary Association, at a special meeting called for the occasion.

Dr. C. J. Mulvey (McGill '94), of Mooers, N. Y., has been granted a two-months leave of absence by the Tuberculosis Committee of Franklin County, N. Y. Dr. Mulvey will resume his work as Franklin County Veterinarian on or about April 15.

Dr. Robert Graham (Iowa '10), of the University of Illinois, delivered the leading address before the annual meeting of the McHenry County (Ill.) Herd Improvement Association, at Woodstock, March 2. Dr. Graham's subject was "Contagious Abortion in Cattle."

Dr. A. J. Durant (Mich. '25), of the veterinary staff of the University of Missouri, was unable to participate in the Special Course for Veterinarians at the institution, January 15-18, on account of being confined to his bed with an attack of influenza, with complications.

Dr. H. L. Campbell (K. C. V. C. '15), of Tuscola, Ill., Douglas County Veterinarian, addressed the Tuscola Rotary Club at a noon-day luncheon the latter part of January. Dr. Campbell spoke on the subject of "Bovine Tuberculosis and Its Dangers to the Human Family."

Dr. Russell McNellis (Iowa '28), who has been stationed at Rouses Point, N. Y., in connection with the Milk Import Act, has resigned his position to go with the United Fruit Company, at Banes, Oriente, Cuba, where he has charge of approximately 6,000 horses, mules and cattle.

Dr. William Harward (U. S. C. V. S. '17), of Albermarle, N. C., is Register of Deeds for Stanley County. Dr. Howard forwarded his 1929 dues about the first of February and apologized for his tardiness. He said that the only excuse that he had to offer was the fact that the young folks rushed him considerably for marriage licenses during the holidays.

Dr. Alvah R. McLaughlin (Mich. '26) has resigned his position in the Department of Physiology and Pharmacology, Michigan State College, in order o accept the position of physiologist and pharmacologist at the University of Wyoming Agricultural Experiment Station, at Laramie. Dr. McLaughlin will assist in the investigation of plants poisonous to live stock.

Dr. T. P. Gallahue (Chi. '17) has been re-engaged as Lake County (Ill.) Veterinarian for the term beginning February 1, at an annual salary of $4100. The expense account of Dr. Gallahue was increased from $600 to $1200 a year. From February 1 to December 1, 1928, 24,594 head of cattle were tested for tuberculosis by Dr. Gallahue and 525 reactors disclosed (2.13%).

Dr. W. A. McDonald (K. C. V. C. '12), B. A. I. Inspector-in-Charge of Tick Eradication in Arkansas, is the proud possessor of McDonald's Eugene Kid, the winner of the all-age class of the Arkansas Amateur Field Trial Association, conducted at Lonoke, November 26, 1928, in which outstanding dogs were entered from the states of Texas, Louisiana, Mississippi, Arkansas and Oklahoma. Dr. McDonald is Vice-President of the Association.

Dr. J. F. Bullard (Corn. '22), formerly a member of the veterinary staff of the Kentucky Agricultural Experiment Station, has accepted a position at Purdue University, as assistant animal pathologist and assistant professor of veterinary science in the Agricultural Experiment Station and Animal Husbandry Department, School of Agriculture. Dr. Bullard will take over a part of the work of the late Dr. George H. Roberts (N. Y. C. V. S. '88).